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SAMPLING AND ANALYSIS PLAN/ QUALITY ASSURANCE PROJECT PLAN OPERABLE UNIT 3, LIBBY ASBESTOS SUPERFUND SITE

Wildfire Contingency Air Monitoring Plan

Revision 0 – August 2012

[Adapted from Attachment D of the OU3 Phase IV Part A Sampling and Analysis Plan]

Prepared by:

U.S. Environmental Protection Agency
Region 8
Denver, CO

With Technical Assistance from:

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Denver, CO

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A1. TITLE AND APPROVAL SHEET

Libby OU3 Sampling and Analysis Plan/Quality Assurance Project Plan: Wildfire Contingency Air Monitoring Plan

REVISION LOG:

Revision #	Revision Date	Description
0	08/07/12	---

APPROVALS:

Christina Progess
EPA, Region 8, Remedial Project Manager, Libby OU3

8/17/12
Date

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8/17/12
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8/17/12
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***The most recent versions of field SOPs, FSDSs, and COC forms are provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3). The most recent versions of laboratory and data verification SOPs are provided electronically in the Libby Lab eRoom (https://team.cdm.com/eRoom/mt/LibbyLab).*

LIST OF ACRONYMS AND ABBREVIATIONS

95UCL	95% Upper Confidence Limit
ABS	Activity-based Sampling
ACM	Asbestos Containing Material
AOC	Administrative Order on Consent
cc	cubic centimeters
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHISQ	Chi-squared
CI	Confidence Interval
COC	Chain-of-Custody
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EDS	energy dispersive spectroscopy
EDXA	Energy-dispersive X-ray
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
f/cc	fibers per cubic centimeter
FS	Feasibility Study
FSDS	Field Sample Data Sheets
FSRZ	Fire Suppression Restriction Zone
FTL	Field Team Leader
GPS	Global Positioning System
GO	Grid Openings
GPS	Global Positioning System
HASP	Health and Safety Plan
HQ	Hazard Quotient
H&S	Health and Safety
ID	identification number
IDW	Investigative-derived Waste
ISO	International Organization for Standardization
IUR	Inhalation Unit Risk
KDC	Kootenai Development Corporation
L/min	liters per minute
LA	Libby amphibole
LC	laboratory coordinator
MCE	Mixed Cellulose Ester
MDEQ	Montana Department of Environmental Quality
mm	millimeter

N	number of asbestos fibers
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
OU	operable unit
OU3	Operable Unit 3
PCM	Phase Contrast Microscopy
PCME	Phase Contrast Microscopy Equivalent
pdf	portable document format
PLM	Polarized Light Microscopy
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QATS	Quality Assurance Technical Support
QC	Quality Control
RBC	Risk-Based Concentration
RfC	Reference Concentration
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROM	Record of Modification
RPM	Remedial Project Manager
SAED	Selected Area Electron Diffraction
SAP	Sampling and Analysis Plan
Site	Libby Asbestos Superfund Site
SOP	Standard Operating Procedure
SRM	standard reference material
s/cc	structures per cubic centimeter
STEL	Short Term Exposure Limit
TAS	Target Analytical Sensitivity
TEM	Transmission Electron Microscopy
TWA	Time Weighted Average
TWF	Time-Weighting Factor
µm	micrometer
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

A Project Management

A3. DISTRIBUTION LIST

This document describes data collection efforts that will be conducted as part of the remedial investigation (RI) for Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site (the Site) to monitor asbestos concentrations in air during forest fires within OU3. This document contains the elements required for both a sampling and analysis plan (SAP) and quality assurance project plan (QAPP).

Copies of this completed/signed SAP/QAPP should be distributed to:

U.S. Environmental Protection Agency, Region VIII
1595 Wynkoop Street; 8EPR-SR
Denver, Colorado 80202-1129

- Victor Ketellapper (electronic copy)
- Christina Progess (2 hard copies, electronic copy)
- Deborah McKean (electronic copy)
- Don Goodrich (electronic copy)
- Dania Zinner (electronic copy)

Montana Department of Environmental Quality
1100 N Last Chance Gulch
Helena, Montana 59601

- John Podolinsky (electronic copy)

CDM Smith – Libby
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Libby, Montana 59923

- Dominic Pisciotta (electronic copy)

CDM Smith – Denver
555 17th Street, Suite 110
Denver, Colorado 80202

- Nathan Smith (electronic copy)

Remedium Group, Inc.
6401 Poplar Avenue, Suite 301
Memphis, TN 38119

- Robert Medler (1 hard copy; electronic copy)
- Robert Marriam (electronic copy)

HDR Engineering, Inc.
1715 South Reserve Street, Suite C
Missoula, Montana 59801-4708

- Sean Everett (electronic copy)

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Libby, Montana 59923

- Vic White (electronic copy)

Libby Ranger District, Canoe Gulch (406-293-8861)
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Libby, Montana 59923

- Nikia Hernandez (electronic copy)

United States Forest Service- Northern Region (406-329-3634)
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Missoula, Montana 59802

- Nancy Rusho (electronic copy)

A4. PROJECT TASK ORGANIZATION

Figure A-1 presents an organizational chart that shows lines of authority and reporting responsibilities for this project. The following sections summarize the entities and individuals that will be responsible for providing project management, SAP/QAPP development, field sampling support, on-site field coordination, analytical support, data management, and quality assurance for this project.

A4.1 Project Management

The U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 is Christina Progess, EPA Region 8. Ms. Progess is a principal data user and decision-maker for Superfund activities within OU3.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The MDEQ Project Manager for OU3 is John Podolinsky. The EPA will consult with MDEQ as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan, and applicable guidance in conducting Superfund activities within OU3.

The USFS is the land management agency for over 20,000 acres within OU3. As such, the USFS is a support agency for this site. The USFS Project Coordinator is Nancy Rusho. The EPA will consult with the USFS while operating on the USFS managed land.

The EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC) for performance of a Remedial Investigation/Feasibility Study (RI/FS) at OU3 of the Libby Asbestos Site. Under the terms of the AOC, W.R. Grace & Co.-Conn. and KDC will implement the activities described in this document, under EPA supervision. The designated Project Coordinator for Respondents W.R. Grace & Co.-Conn. and KDC is Robert Medler of Remedium Group, Inc. He is assisted by Robert Marriam of Remedium Group, Inc.

A4.2 SAP/QAPP Development

The *Wildfire Contingency Monitoring Plan* was originally included as an attachment to the Phase IV Part A SAP (EPA 2010a). This document was developed to update the original monitoring plan and create a stand-alone SAP/QAPP for this sampling effort. This document supersedes the original *Wildfire Contingency Monitoring Plan*.

This SAP/QAPP was developed by CDM Federal Programs Corporation (CDM Smith) at the direction of and with oversight by the EPA. This SAP/QAPP contains all the elements required for both a field sampling plan and QAPP and has been developed in general accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001) and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006).

Copies of this SAP/QAPP will be distributed to the individuals above by CDM Smith, either in hard copy or in electronic format (as indicated in Section A3). The CDM Smith Project Manager (or their designate) is responsible for maintaining the SAP/QAPP and will distribute updated copies each time a document revision occurs. A copy of the final, signed SAP/QAPP (and any subsequent revisions) will also be posted to the OU3 website[1] and the OU3 eRoom[2].

A4.3 Field Sampling Support

All field collection activities described in this SAP/QAPP will be performed by W.R. Grace & Co.-Conn. and KDC and their contractors, in strict accordance with this SAP/QAPP. W.R. Grace & Co.-Conn. and KDC will be supported in this field work by Mike Chapman of Chapman Construction, Inc.

A4.4 On-Site Field Coordination

Access to the mine and other areas of OU3 via Rainy Creek Road is currently restricted and is controlled by the EPA. The on-site point of contact for access to the mine is Rob Burton of Project Resources, Inc. and Environmental Restoration:

[1] http://cbec.srcinc.com/libby/
[2] https://team.cdm.com/eRoom/mt/LibbyOU3

rob.burton@priworld.com
(406) 293-3690

A4.5 Analytical Support

All samples collected as part of this project for asbestos analysis will be sent for preparation and/or analysis to laboratories that meet the Libby-specific laboratory criteria that have been established for the project. These criteria are specified in **Appendix E**. Remedium may choose whether asbestos analytical laboratory services are procured directly or if services will be provided via EPA.

A4.6 Data Management

Administration of the master database for OU3 will be performed by EPA contractors. The primary database administrator will be Lynn Woodbury of CDM Smith. She will be responsible for sample tracking, uploading new data, performing data verification and error checks to identify incorrect, inconsistent or missing data, and ensuring that all data are checked and corrected as needed. When the OU3 database has been populated, checked and validated, relevant asbestos data may be transferred into a Libby Asbestos Site database, as directed by the EPA for final storage.

A4.7 Quality Assurance

There is no one individual designated as the EPA Quality Assurance Manager (QAM) for the Libby project. Rather, the Region 8 quality assurance (QA) program has delegated authority to the EPA RPMs. This means that the EPA RPMs have the ability to review and approve governing investigation documents developed by Site contractors. Thus, it is the responsibility of the EPA RPM for OU3, who is independent of the entities planning and obtaining the data, to ensure that this SAP/QAPP has been prepared in accordance with the EPA QA guidelines and requirements. The EPA RPM is also responsible for managing and overseeing all aspects of the quality assurance/quality control (QA/QC) program for OU3. In this regard, the EPA RPM is supported by the EPA Quality Assurance Technical Support (QATS) contractor, Shaw Environmental, Inc. The QATS contractor will evaluate and monitor QA/QC sampling and is responsible for performing annual audits of each analytical laboratory. In addition, HDR Engineering, Inc. has been contracted by the EPA to provide oversight of field sampling and data collection activities.

A5. PROBLEM DEFINITION/BACKGROUND

A5.1 Site Background

Libby is a community in northwestern Montana that is located near a large open-pit vermiculite mine. Vermiculite from the mine at Libby is known to be contaminated with amphibole asbestos that includes several different mineralogical classifications, including richterite, winchite, tremolite, and possibly actinolite (Meeker *et al.* 2003). For the purposes of EPA investigations at the Libby Asbestos Superfund Site, this mixture is referred to as Libby amphibole (LA).

Historic mining, milling, and processing of vermiculite at the site are known to have caused releases of vermiculite and LA to the environment. Inhalation of LA associated with the vermiculite is known to have caused a range of adverse health effects in exposed humans, including workers at the mine and processing facilities (Amandus and Wheeler 1987, McDonald *et al.* 1986, McDonald *et al.* 2004, Sullivan 2007, Rohs *et al.* 2007), as well as residents of Libby (Peipins *et al.* 2003). Based on these adverse effects, the EPA listed the Libby Asbestos Superfund Site on the National Priorities List in October 2002. Starting in 2000, the EPA began taking a range of cleanup actions at the site to eliminate sources of LA exposure to area residents and workers using CERCLA (or Superfund) authority.

The EPA has designated a number of operable units (OUs) for the site due to its size and complexity. This document focuses on investigations at OU3. OU3 includes the property in and around the former vermiculite mine and the area surrounding the mine that has been impacted by releases and subsequent migration of hazardous substances and/or pollutants or contaminants from the mine. **Figure A-2** shows the location of the mine and the preliminary study area boundary for OU3. The EPA established the preliminary study area boundary for the purpose of planning and developing the scope of the RI/FS for OU3. This study area boundary may be revised as data are obtained during the RI for OU3 on the nature and extent of environmental contamination associated with releases that may have occurred from the mine site. The final boundary of OU3 will be defined by the final EPA-approved RI/FS.

The EPA is concerned with environmental contamination in OU3 because the area could be used by humans for a variety of activities, including recreational activities (e.g., hiking), wood gathering by local residents, commercial logging, and, in the case of USFS employees, land management and fire-fighting activities. The area is also habitat for a wide range of ecological receptors (both aquatic and terrestrial). This SAP focuses on the potential exposures of residents and workers to LA as a result of a forest fire within OU3.

The EPA is currently engaged in a Remedial Investigation (RI) to collect data needed to evaluate potential risks to people and ecological receptors that may be exposed to LA or other mining related contaminants in OU3 of the Libby Asbestos Superfund site. The RI is being planned and

implemented in phases. Each phase of the RI has been planned by the EPA with input from EPA risk assessors, toxicologists, environmental scientists, and risk managers. The EPA also seeks and considers input from the State and all other concerned parties, including the U.S. Fish and Wildlife Service, the USFS, W.R. Grace & Co.-Conn., and KDC.

A5.2 Reasons for this Project

Studies performed to date as part of the RI for OU3 have revealed that soil, tree bark, and duff (i.e., organic litter and debris on the forest floor) in the vicinity of the former vermiculite mine have been impacted by historic releases of LA (EPA 2008a, EPA 2009). It has been documented that inhalation of LA associated with the vermiculite may cause a range of adverse health effects in some exposed humans. Forest fires that occur within contaminated areas of OU3 may result in the release of LA fibers into air although the magnitude of the release is unknown. The release of LA fibers to air as a result of a forest fire could expose people in surrounding areas and in areas downwind of the fire.

Smoke is a mixture of heated particles and gases and it is impossible to predict the exact composition of smoke produced by a forest fire. The products (e.g., trees, brush, grasses, duff) being burned, the temperature of the fire, and the amount of oxygen available to the fire, all make a difference in the type of smoke produced. Small particles of soot and ash from a fire may continue to be deposited on an area for many days and depending on atmospheric conditions the area of pollution may extend beyond the range of the fire. At present, no data are available on the concentration of LA fibers that may be released during a forest fire within OU3. In addition, available data are not adequate to support reliable quantitative estimation of the air concentrations of asbestos fibers that may occur as a result of a forest fire in OU3. Thus, measured data are needed to provide information on the magnitude of potential exposure to LA for individuals (e.g., residents and workers) exposed to smoke from a forest fire within OU3.

The purpose of this document is to present a plan for establishing air monitoring stations and for collecting air samples that will provide preliminary information on the levels of LA in ambient area that may occur in the surrounding community during forest fires in OU3 (see **Figure A-2**). The resulting data may be useful in the RI for OU3 but the primary purpose of the data are to inform the general public and the USFS of air impacts from forest fires within OU3 and to provide information to assist in emergency response measures.

A5.3 Applicable Criteria and Action Limits

At present, there are no criteria or action limits that apply specifically to individuals (e.g., residents, workers) potentially exposed to LA in smoke from forest fires.

Criteria for exposure of workers to asbestos in workplace air have been established by the Occupational Safety and Health Administration (OSHA). The short-term (30-minute) exposure

limit (STEL) is 1.0 fibers per cubic centimeter (f/cc), and the long-term time-weighted average (TWA) exposure limit is 0.1 f/cc. Both exposure limits are expressed in terms of phase contrast microscopy (PCM) fibers (OSHA 2002), which does not distinguish between asbestos and non-asbestos fibers.

At the Libby Site, the EPA has developed action levels and cleanup criteria for LA that are applicable to emergency response actions performed at residential/commercial properties (EPA 2003). However, these criteria are not applicable to locations outside of the Site. In addition, final action levels for the Site will not be developed until completion of the RI/FS and the publication of the record of decision. Thus, there are no LA-specific criteria or action limits that apply to this sampling program.

A6. PROJECT DESCRIPTION

A6.1 Project Summary

This document provides an opportunistic monitoring plan for collecting ambient air data to evaluate potential human exposure to LA in smoke and fallout resulting from authentic forest fires in OU3. Ambient air samples will be collected at three stationary stations and one mobile sampling station if a forest fire occurs in OU3 (**Figure A-2**). These data will provide preliminary information on the levels of LA in ambient area that may occur in residential areas as a result of a forest fire in OU3. Basic tasks that are required to implement this investigation are described in greater detail in subsequent sections of this SAP/QAPP.

A6.2 Work Schedule

Because the goal of the study is to collect ambient air samples during a forest fire for LA analysis, there are no established temporal bounds. That is, samples will be collected whenever a significant forest fire occurs in OU3. Based on USFS records, fires are most likely to occur during the dry summer months (typically July, August, and September).

A6.3 Locations to be Studied

Locations where ambient air sampling activities may be performed are described in detail in Section B2.1. The plan is to sample at three fixed air monitoring stations located at the camping area at McGillivray Access, the CDM Smith office in Libby, and the USFS Canoe Gulch Ranger Station along Highway 37, and at one mobile air monitoring station deployed downwind of the fire.

A6.4 Resources and Time Constraints

The greatest time constraint is that sampling activities must be conducted during a forest fire under uncontrolled conditions. Depending on the duration of the forest fire, stationary and mobile air monitors may be limited by the time and volume of air required to collect representative air samples. Importantly, sampling time may be limited by safety concerns for sampling personnel.

A7. QUALITY OBJECTIVES AND CRITERIA

A7.1 Data Quality Objectives

Data Quality Objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The design of a study is closely tied to the DQOs, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected and the types of analyses to be performed. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a field sampling program will be adequate to support reliable site-specific risk management decision-making (EPA 2001, 2006).

Appendix A provides the detailed implementation of the seven-step DQO process associated with this SAP/QAPP.

A7.2 Performance Criteria

The range of LA concentrations that will occur in ambient air during a forest fire in OU3 is not known. However, it is possible to estimate the concentration levels that correspond to a level of human health concern. These calculations are provided in Section B4. The analytical requirements for LA measurements in ambient air as established in Section B4 ensure concentrations will be reliably detected and quantified if present at levels of concern.

A7.3 Precision

The precision of asbestos measurements is determined mainly by the number (N) of asbestos fibers counted in each sample. The coefficient of variation resulting from random Poisson counting error is equal to $1/N^{0.5}$. In general, when good precision is needed, it is desirable to count a minimum of 3-10 fibers per sample, with counts of 20-25 fibers per sample being optimal.

A7.4 Bias/Accuracy and Representativeness

It is expected that LA levels in ambient air may vary widely as a function of location and meteorological conditions. Stationary locations selected for evaluation in this study are intended to be representative of what may occur in the surrounding community during a fire in OU3 and the mobile sampling location is intended to represent the high-end of what may occur, so the measured levels of LA in ambient air may be biased high for residents and workers. However, monitoring results from these locations would not be representative for fire fighters; therefore, potential exposure for this group of receptors is evaluated with activity-based sampling (ABS) as described in the *Addendum for Opportunistic Sampling During Authentic Wildfires* (EPA 2011a).

A7.5 Completeness

Target completeness for this project is 100%. If any air monitoring samples are not collected, or if LA analysis is not completed successfully, this could result in that portion of the study providing no useful information. In this event, additional sampling may be needed to support risk management decision-making.

A7.6 Comparability

The data generated during this study will be obtained using sample collection, preparation, and analysis methods for measuring LA in air used previously at OU3. The use of consistent methods will yield data that are comparable to previous results of LA analyses in air.

A7.7 Method Sensitivity

The method sensitivity (analytical sensitivity) needed for the analysis of LA in air is discussed in Section B4.

A8. SPECIAL TRAINING/CERTIFICATIONS

A8.1 Field

Asbestos is a hazardous substance that can increase the risk of cancer and serious non-cancer effects in people who are exposed by inhalation. Therefore, all individuals involved in the collection, packaging, and shipment of samples must have OSHA 40-hour health and safety training, and respiratory protection training as required by 29 Code of Federal Regulations (CFR) 1910.134. Individuals must also have asbestos awareness training, as required by 29 CFR 1910.1001, as well as training in sample collection techniques and use of personal protective equipment. All training documentation will be stored in the appropriate field office. It is the

responsibility of the field health and safety (H&S) manager to ensure that all training documentation is up-to-date and on-file for each field team member.

It is the responsibility of Remedium Group, Inc., or their contractors, to ensure that sampling is conducted in accordance with the project *Health and Safety Plan* (HASP) and to maintain appropriate documentation of training by active field personnel.

Prior to beginning field sampling activities, a field planning meeting will be conducted to discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- Required quality control (QC) measures
- Health and safety requirements

It is the responsibility of each field team member to review and understand all applicable governing documents associated with this sampling program.

A8.2 Laboratory

A8.2.1 Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Each laboratory is accredited by the National Institute of Standards and Technology (NIST) and National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of airborne asbestos by transmission electron microscopy (TEM). This includes the analysis of NIST/NVLAP standard reference materials (SRMs), or other verified quantitative standards, and successful participation in two proficiency rounds per year of airborne asbestos by TEM supplied by NIST/NVLAP.

Copies of recent proficiency examinations from NVLAP or an equivalent program, as well as certifications from other state and local agencies, are maintained by each participating analytical laboratory. Copies of all proficiency examinations and certifications are also maintained by the laboratory coordinator (LC) (Remedium Group, Inc.).

Each laboratory working on the Libby project is also required to pass an on-site EPA laboratory audit. The details of this EPA audit are discussed in Section C1.1.2. The LC also reserves the right to conduct any additional investigations deemed necessary to determine the ability of each laboratory to perform the work. Each laboratory also maintains appropriate certifications from the state and possibly other certifying bodies for methods and parameters that may also be of

interest to the Libby project. These certifications require that each laboratory has all applicable state licenses and employs only qualified personnel. Laboratory personnel working on the Libby project are reviewed for requisite experience and technical competence to perform asbestos analyses. Copies of personnel resumes are maintained for each participating laboratory by the LC in the Libby project file.

A8.2.2 Laboratory Team Training/Mentoring Program

Training/Mentoring

The orientation program to help new laboratories gain the skills needed to perform reliable analyses at the Site involves successful completion of a training/mentoring program that was developed for new laboratories prior to their analysis of Libby field samples. All new laboratories are required to participate in this program. The program includes training provided by the QATS contractor and/or senior personnel from other Libby team laboratories. The training/mentoring process includes a review of morphological, optical, chemical, and electron diffraction characteristics of LA, as well as training on project-specific analytical methodology, documentation, and administrative procedures used on the Libby site. The mentoring process also includes a general EPA audit, which is performed by the QATS contractor, to determine the general capabilities of the laboratory, the adequacy of facilities and instrumentation, and evaluate of the laboratory quality management system. The mentor will also review the analysis of at least one proficiency demonstration sample for each analytical method with the trainee laboratory.

Once the laboratory has satisfactorily completed the training/mentoring program, they can begin to support the analysis of Libby field samples. Initially, all submitted analytical results will undergo a detailed data verification and validation review (see Section D2). The frequency of these reviews can be reduced if no issues are identified. The QATS contractor may also perform a subsequent EPA audit to evaluate analyses of Libby field samples.

Site-Specific Reference Materials

Because LA is not a common form of asbestos, the U.S. Geological Survey (USGS) prepared site-specific reference materials using LA collected at the Libby mine site (EPA 2008b). Upon entry into the Libby program, each laboratory is provided samples of these LA reference materials. Each laboratory is required to analyze multiple LA structures present in these samples by TEM in order to become familiar with the physical and chemical appearance of LA and to establish a reference library of LA energy dispersive spectroscopy (EDS) spectra. These laboratory-specific and instrument-specific LA reference spectra (EPA 2008c) serve to guide the classification of asbestos structures observed in Libby field samples during TEM analysis.

Regular Technical Discussions

On-going training and communication is an essential component of QA for the Libby project. To ensure that all laboratories are aware of any technical or procedural issues that may arise, a regular teleconference is held between the EPA, their contractors, and each of the participating laboratories. Other experts (e.g., USGS) are invited to participate when needed. These calls cover all aspects of the analytical process, including sample flow, information processing, technical issues, analytical method procedures and development, documentation issues, project-specific laboratory modifications, and pertinent asbestos publications.

Professional/Technical Meetings

Another important aspect of laboratory team training has been the participation in technical conferences. The first of these technical conferences was hosted by USGS in Denver, Colorado, in February 2001, and was followed by another held in December 2002. The Libby laboratory team has also convened on multiple occasions at the Johnson Conference in Burlington, Vermont, including in July 2002, July 2005, July 2008, and July 2011, and at the Michael E. Beard Asbestos Conference in San Antonio, Texas in January 2010. In addition, members of the Libby laboratory team attended an EPA workshop to develop a method to determine whether LA is present in a sample of vermiculite attic insulation held in February 2004 in Alexandria, Virginia. These conferences enable the Libby laboratory and technical team members to have an on-going exchange of information regarding all analytical and technical aspects of the project, including the benefits of learning about developments by others.

A8.2.3 Analyst Training

All TEM analysts for the Libby project undergo extensive training to understand TEM theory and the application of standard laboratory procedures and methodologies. The training is typically performed by a combination of personnel, including the laboratory manager, the laboratory QAM, and senior TEM analysts.

In addition to the standard TEM training requirements, trainees involved with the Libby project must familiarize themselves with Site-specific method deviations, project-specific documents, and visual references. Standard samples that are often used during TEM training include known pure (traceable) samples of chrysotile, amosite, crocidolite, tremolite, actinolite and anthophyllite, as well as fibrous non-asbestos minerals such as vermiculite, gypsum, antigorite, kaolinite, and sepiolite. New TEM analysts on the Libby project are also required to perform an EDS spectra characterization evaluation on the LA-specific reference materials provided during the initial training program to aide in LA mineralogy recognition and definition (similar to EPA 2008c). Satisfactory completion of each of these tasks must be approved by a senior TEM analyst.

All TEM analysts are also trained in the Site-specific laboratory QA/QC program requirements for TEM (see Section B5.2.3). The entire program is discussed to ensure understanding of requirements and responsibilities. In addition, analysts are trained in the project-specific reporting requirements and data reporting tools utilized in transmitting results. Upon completion of training, the TEM analyst is enrolled as an active participant in the Libby laboratory program.

A training checklist or logbook is used to assure that the analyst has satisfactorily completed each specific training requirement. It is the responsibility of the laboratory QAM to ensure that all TEM analysts have completed the required training requirements.

A9. DOCUMENTATION AND RECORDS

A9.1 Field Documentation

Field teams will record sample information on the most current version of the Site-specific field sample data sheets (FSDSs) developed for smoke monitoring at stationary and mobile air monitors[3]. Section B3.1 provides detailed information on the sample documentation requirements for samples collected as part of this study. In brief, the FSDS forms document the unique sample identification (ID) number assigned to every sample collected as part of this program. In addition, the FSDSs provide information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate). The field teams will also record information related to sample collection in a field logbook.

A9.2 Laboratory

All analytical data for asbestos generated in the analytical laboratory will be documented on Site-specific laboratory bench sheets. Section B4.2 provides detailed information on the requirements for laboratory documentation and records. In brief, the data recorded on the bench sheets are entered into a Site-specific electronic data deliverable (EDD) template spreadsheet developed for recording TEM results for air[4]. It is the responsibility of each laboratory to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures. Upon completion of the appropriate analyses, the EDD spreadsheets, along with scanned copies of all analytical laboratory data packages, will be posted to the OU3 eRoom.

A9.3 Record of Modification

It is the also responsibility of the field team and laboratory staff to maintain logbooks and other internal records throughout the sample lifespan as a record of sample handling procedures.

[3] The most recent versions of these FSDS form templates are available in the OU3 eRoom.
[4] The most recent version of the TEM EDD for air is provided in the Libby Lab eRoom.

Significant deviations (i.e., those that impact or have the potential to impact investigation objectives) from this SAP/QAPP, or any procedures referenced herein governing sample handling, will be discussed with the EPA RPM (or their designate) prior to implementation. Such deviations will be recorded on a Record of Modification (ROM) form. Sections B5.1.2 and B5.2.2 provide detailed information on the procedures for preparing and submitting ROMs by field and analytical laboratory personnel, respectively.

B Data Generation and Acquisition

B1. STUDY DESIGN

B1.1 Sampling Locations

Naturally-occurring forest fires may occur at any location in the forested area of OU3. Available data on levels of LA measured in tree bark, soil, and duff indicate that, in general, the levels of LA tend to decrease with distance away from the center of the mine. Based on data obtained by EPA on environmental levels of LA contamination in duff, bark, and soil around the mine, the USFS has established a Fire Suppression Restriction Zone (FSRZ), which is currently defined as the OU3 boundary, as shown in **Figure B-1**. This is an area inside of which the USFS has determined that ground-based firefighters must wear respiratory protection when attacking fires.

During a fire in OU3, air monitoring will be performed at three fixed stations and one mobile station. **Figure B-1** shows the location of stationary air monitors and presents the general area identified for conducting mobile ambient air sampling activities. Each of these locations is described in more detail below.

Fixed Station 1 (F1): Based on meteorological data collected at the mine site, the predominant wind direction at OU3 is to the north-northeast (see **Figure B-2**). This means that smoke and LA released from fires in OU3 is most likely to be transported in that direction. It is believed that levels of environmental LA contamination are likely to be highest in areas that are north-northeast of the mine. Consequently, sampling air/smoke from fires that occur within several miles of the mine in the north-northeast direction is especially important. Under current conditions, most of the land north and east of the former mine is owned by the USFS or by logging companies and human occupancy in this area is sparse. Based on this, during a fire event, one monitoring station will be established at a location in the downwind direction, west of Lake Koocanusa within the camping area at McGillivray Access.

Fixed Station 2 (F2): Because Libby is the location of the highest population density near the mine, a second air monitor will be established on the east side of the town of Libby to provide information on exposure levels to this population. The location of this monitor will be at the CDM Smith offices (60 Port Boulevard).

Fixed Station 3 (F3): A third monitoring station will be established along Highway 37 at the USFS Canoe Gulch Ranger Station. This location was chosen based on its proximity to OU3 and the fact that people routinely occupy the station during work hours.

Mobile Station: In addition to the three stationary monitors at fixed locations, a fourth monitor will be deployed to an area downwind of the fire. The monitor will be transported to

the collection site by truck. The sampling location and distance from the fire will depend on the conditions of the fire. The actual location selected for the mobile sampler will depend upon the ease of access for the truck hauling the sample equipment and safety concerns for sampling personnel. Although details may vary, it is envisioned that the monitor will be placed on a tripod in the back of the truck. During sample collection, the coordinates of the monitor will be recorded. This information will be used later, in combination with data on the fire location, to establish the distance and direction of the monitor relative to the fire. The wind direction and speed at the sampling location should also be monitored.

B1.2 Sample Collection

Forest fires in OU3 that disturb contaminated environmental media may release LA to ambient air. This is of concern because people exposed to the smoke may inhale LA fibers, thereby increasing the risk of adverse health effects. The human populations of potential concern for this investigation are area residents and workers exposed to smoke from a forest fire in OU3. The data needed to evaluate exposure consists of measurements or estimates of LA concentration [expressed in units of structures per cubic centimeter (s/cc) in breathing zone air] of people being evaluated.

The sample strategy for this investigation is direct measurement. In this approach, samples of air are collected in the vicinity of forest fires that occur in OU3 and these samples are analyzed for LA. The chief advantage of this approach is that the data are inherently realistic and representative. The chief disadvantage is that fires occur at random times and in random locations, so collection of the data is difficult to plan and implement. In addition, there is an inherent hazard to people who are in close proximity to any uncontrolled wildfire in OU3.

Because the goal of the study is to monitor ambient air during forest fires, there are no established temporal bounds. That is, samples will be collected whenever significant forest fires occur in OU3. Air sampling at the three fixed monitoring stations will not occur except during times that a fire is burning in OU3, and smoke from the fire is reaching the vicinity of one or more of the fixed monitors. [Note: This may include any controlled burns conducted by the USFS in OU3, as may be appropriate.]

Notification that a fire is occurring in OU3 will be provided to the field sampling team by the USFS as soon as possible after a fire is known to be occurring. If smoke is blowing toward Libby, the field crews will then activate all three monitors as soon as possible after notification. The person to be contacted in the event of a fire within OU3 is:

Mike Chapman
406-293-1983
chapman@montanasky.net

Because the occurrence of fires is random, the number of fires occurring in any one fire season cannot be controlled or predicted. Therefore, depending on the LA concentration levels observed and the locations of fires that occur, it may be necessary to operate this program for two or more years until sufficient data are obtained to provide a reliable basis for decision-making. The need for continued sampling will be determined periodically based on a review of data obtained to date.

B1.3 Study Variables

The level of LA in ambient air resulting from forest fires and fire fighting activities can depend on factors that may vary quickly during a fire (e.g., wind speed, wind direction, temperature, soil moisture, humidity, etc.). As noted previously, fires occur generally in the drier months of the year (typically July, August, and September) when temperatures are higher, and soil moisture and humidity are low.

Air monitoring should be performed under conditions that have a high probability of resulting in measureable air concentrations of LA. To ensure that sampling conditions are generally favorable towards the detection of LA fibers, sample locations have been selected in areas where the greatest probability of detecting LA released as a result of a forest fire may occur, as well as areas that would be representative of residential exposure. To supplement data from stationary air monitoring locations, a mobile air monitoring sampler will be deployed to capture air measurements closer to the fire.

B1.4 Critical Measurements

The critical measurements for this project are measurements of the concentration of LA in ambient air during a forest fire at locations representative of areas of potential exposure and at areas that are anticipated to have higher levels of LA contamination due to the prevalent wind direction. The analysis of LA may be achieved using several different types of microscopes, but the EPA generally recommends using TEM because this analytical method has the ability to clearly distinguish asbestos from non-asbestos structures, and to classify different types of asbestos (i.e., LA, chrysotile). In addition, analysis by TEM allows for the estimation of PCM-equivalent[5] (PCME) concentrations, which is the concentration metric necessary to estimate exposure and risks.

[5] PCME structures have a length greater than 5 microns (μm), width greater than or equal to 0.25 μm, and aspect ratio greater than or equal to 3:1.

B1.5 Data Reduction and Interpretation

Ambient air samples collected in the field will be used to prepare grids for TEM examination (see Section B4). From this examination, the total number of PCME LA structures observed is recorded and the air concentration is calculated as follows:

$$Cair = (N \cdot EFA) / (GOx \cdot Ago \cdot V \cdot 1000 \cdot f)$$

where:

Cair = Air concentration (structures per cubic centimeter [s/cc])
N = Number of PCME LA structures observed (structures)
EFA = Effective filter area (mm^2)
GOx = Number of grid openings examined
Ago = Area of a grid opening (mm^2)
V = Sample air volume (L)
1000 = L/cc (conversion factor in liters per cubic centimeter)
f = Indirect preparation dilution factor (assumed to be 1 for direct preparation)

Data for PCME LA concentrations in ambient air will be used to evaluate potential human health risks from forest fires in OU3 and to provide information for emergency response activities.

B2. SAMPLING METHODS

B2.1 Ambient Air Sample Collection

All air samples will be collected in basic accord with SOP AMB-LIBBY-03 (see **Appendix B**). Each air sample will be collected using a stationary air monitor.

Pumps may be either battery-powered or provided with 110 volt power from a reliable source. Air sampling cassettes will utilize a 25 milllimeter (mm) diameter mixed cellulose ester (MCE) with a pore size of 0.8 um. Target pump rates will be 5 ± 0.5 liters per minute (L/min).

Each air sampling pump will be calibrated at the start of each sampling event using the primary calibrator (BIOS Drycal). Calibration will be considered complete when the measured flow is within ±5% of the target flow (5 liters/min), as determined by the mean of three measurements. Each BIOS Drycal used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag.

For the three fixed air monitoring stations, each sample will be collected over a time period of about 24 hours. Sample collection will be repeated for 24-hour intervals as long as smoke from the fire continues to reach the community. To minimize this possibility, pump flow rates should

be checked regularly throughout the collection period and filter cassettes should be changed if flow rates become impacted.

For the mobile air monitor, the sampling time depends on the level of smoke reaching the sampling station, as well as on the speed that the fire is moving. Assuming that there are no safety concerns, the sampling duration for the mobile monitor shall be about 30-60 minutes, depending on smoke level.

NOTE: In all cases, it is critical that mobile station sampling be performed in a way that does not endanger that health or safety of the sampling personnel. If conditions are considered to be potentially unsafe, the sampler should evacuate the area immediately.

B2.2 Global Positioning System Coordinate Collection

Global Positioning System (GPS) coordinates are already available for stationary air monitoring locations, thus it is not necessary to record GPS coordinates unless the location changes. GPS coordinates should be obtained for the various mobile air monitoring locations to provide the spatial extent of the sampling area evaluated in the air monitoring event during a forest fire. GPS location coordinates will be collected in general accordance with OU3-specific SOP No. 11, *GPS Data Collection* (see **Appendix B**).

B2.3 Equipment Decontamination

Decontamination of non-disposable sampling equipment will be conducted in basic accordance with the procedures specified in OU3-specific SOP No. 7, *Equipment Decontamination* (see **Appendix B**). Materials used in the decontamination process will be disposed of as investigation-derived waste (IDW) as described below.

B2.4 Handling Investigation-derived Waste

Any disposable equipment or other IDW will be handled in basic accordance with the procedures specified in OU3-specific SOP No. 12, *IDW Management* (see **Appendix B**). In brief, IDW will be double bagged in clear heavy-weight trash bags with 'IDW' written, in large letters at least 3 inches high, in indelible ink on at least two sides of the outer bag. All IDW generated during this sampling program will enter the waste stream at the local class IV asbestos landfill.

B3. SAMPLE HANDLING AND CUSTODY

B3.1 Sample Documentation

B3.1.1 Field Sample Data Sheets and Logbooks

All necessary information associated with samples from each fire event shall be recorded using the most current version of the OU3-specific FSDS form for each air sample (see **Appendix C**) in accordance with the procedures specified in OU3-specific SOP No. 9, *Field Documentation* (see **Appendix B)**. Scanned copies of all FSDS forms and field logbooks will be posted to the OU3 eRoom on a weekly basis.

Key data items recorded on the FSDS include the following:

- Name or initials of the person collection the samples
- GPS coordinates for sampling location (if appropriate)
- The sample identifier (ID) assigned to each sample cassette, along with the start time and stop time for each sample.
- At the time of collection, each sample will be labeled with a unique 5-digit sequential identification (ID) number.
- Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank).
- The target flow rate to which the pump has been pre- and post-calibrated.
- Any other information needed to evaluate the reliability and representativeness of the air samples.

Each field sampling team will also maintain a field logbook. The logbook shall record all potentially relevant information on sampling activities and conditions that are not otherwise captured on the FSDS form. The field logbook is an accounting of activities at the Site and will duly note problems or deviations from the governing SAP/QAPP or SOPs. Separate field logbooks will be kept for each study and the cover of each field logbook will clearly indicate the name of the associated study. Field logbooks will be completed prior to leaving a sampling location. Field logbooks will be checked for completeness on a daily basis by the field team leader (FTL) or their designate. When incorrect field logbook completion procedures are discovered during these checks, the errors will be discussed with the author of the entry and corrected. Erroneous information recorded in a field logbook will be corrected with a single line strikeout, initial, and date. The correct information will be entered in close proximity to the erroneous entry.

Examples of the type of information to be captured in the field logbook include:

- Names of team members
- Guidance document title, date, and revision (if applicable)
- Date

- Fire event information:
    - A description of the fire location
    - A description of the nature of the fire (e.g., size, intensity, type of material burning, etc.)
    - A description of meteorological conditions (e.g., wind speed and direction, behavior of the smoke plume)
- Weather conditions
- Field sketches
- Address or physical description of the location relative to permanent landmarks
- Number and type of samples collected
- Any special circumstances that influenced sample collection
- Any deviations from sampling SOPs

B3.1.2 Photographic and Video Documentation

Photographs will be taken to document representative examples of sampling locations and site conditions during air sampling activities and at any other location the field sampling personnel determine necessary, using a digital camera. As appropriate, digital video may be captured to document representative examples of smoke movement during air sampling. During a fire sampling event photographs or video should be taken from locations 360° surrounding the sample location (e.g. north, south, east, and west) and the direction of each photograph should be recorded. Electronic copies of all digital photographs and video will be posted weekly to the OU3 eRoom. The file name should include the corresponding sampling location and/or sample number and the photograph date (e.g., OU3Fire_9-15-12).

B3.2 Sample Labeling and Identification

Samples will be labeled with sample ID numbers supplied by field administrative staff and will be signed out by the sampling teams. For air samples, one sample label will be placed on the sampling cassette, one sample label will be affixed to the inside of the plastic bag used to hold the sampling cassette during transport. In addition, the sample ID number will also be written on the outside of the plastic bag.

Sample ID numbers will identify the samples collected during this sampling effort using the following format:

SM-#####

where:

SM- = A sample ID number prefix to identify samples collected under this SAP/QAPP

= A sequential five-digit number

B3.3 Field Sample Custody

Field sample custody will follow the requirements specified in OU3-specific SOP No. 9 (see **Appendix B**). In brief, all teams will ensure that samples, while in their possession, are maintained in a secure manner to prevent tampering, damage, or loss. All samples and FSDSs will be relinquished by field staff to the field sample coordinator or a designated secure sample storage location at the end of each day.

B3.4 Chain of Custody

The chain of custody (COC) record is employed as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting and to identify the type of analysis requested. A completed COC form specific to the Libby OU3 sampling is required to accompany each shipment of samples. Sample custody will be maintained until final disposition of the samples by the laboratory and acceptance of analytical results by the EPA.

OU3-specific COC forms can be obtained from the OU3 eRoom (an example of this form is provided in **Appendix D**). In brief, the field sample coordinator will prepare a hard copy COC form using the 3-page carbon copy forms developed specifically for use in this investigation. One copy of the COC will be retained by the field sample coordinator and the other two copies (including the original) of the COC will accompany the sample shipment. All required paper work, including sample container labels, COC forms, custody seals and shipping forms will be fully completed in indelible ink (or printed from a computer) prior to shipping of the samples to the laboratory. Each COC form will include signatures of the appropriate individuals indicated on the form. In addition, the air volume for each sample should be recorded on the COC form. Shipping to the appropriate laboratory from the field will occur through overnight delivery. All samples that may require special handling by laboratory personnel to prevent potential exposure to LA or other hazardous substances will be clearly labeled.

If any errors are found on a COC after shipment, the hard copy of the COC retained by the field sample coordinator will be corrected and a corrected COC will be provided to the LC (Remedium) for distribution to the appropriate laboratory. All corrections to the COC form will be initialed and dated by the person making the corrections.

B3.5 Sample Packaging and Shipping

Samples will be packaged and shipped in basic accordance with the procedures specified in OU3-specific SOP No. 8, *Sample Handling and Shipping* (see **Appendix B**). In brief, samples will be hand-delivered to the laboratory, picked up by a delivery service courier, or shipped by a delivery service to the designated laboratory, as applicable. For samples requiring shipment,

prior to sealing the shipping container, the field sample coordinator will complete the bottom of the COC record and retain the bottom copy of the COC record for the project record. The LC (Remedium) will instruct the field sample coordinator as to the appropriate laboratory for each sample shipment.

B3.6 Holding Times

In general, there are no holding time requirements for asbestos. Thus, there are no holding time requirements for air samples collected as part of this sampling investigation.

B3.7 Archival and Final Disposition

All sample materials, including filters, and grids will be maintained in storage at the analytical laboratory unless otherwise directed by the EPA. When authorized by the EPA, the laboratory will be responsible for proper disposal of any remaining samples, sample containers, shipping containers, and packing materials in accordance with sound environmental practice, based on the sample analytical results. The laboratory will maintain proper records of waste disposal methods, and will have disposal company contracts on file for inspection.

B4. ANALYTICAL METHODS

This section discusses the analytical methods and requirements for samples collected in support of the ambient air sampling program during a forest fire. This section includes detailed information on the analysis of air as well as the data reporting requirements, sample holding times, and custody procedures.

An analytical requirements summary sheet (**OU3FIRE-0812**), which details the specific preparation and analytical requirements associated with this sampling program, is provided in **Appendix F**. The analytical requirements summary sheet will be reviewed and approved by all participating laboratories in this sampling program prior to any sample handling. A copy of this analytical requirements summary sheet will be submitted with each COC.

B4.1 Analysis of LA in Air Samples

The DQOs for the ambient air sampling effort during a forest fire (see **Appendix A**) provide detailed information on the sample preparation, analysis method, counting rules, and stopping rules. All air samples collected during forest fires in OU3 will be analyzed using TEM ISO 10312, modified to allow for the rapid turn-around of results. Analysis requirements for the TEM analysis are summarized below.

B4.1.1 Counting Rules

Samples of air collected from stationary and mobile monitors will be submitted for asbestos analysis using TEM ISO 10312. Grids will be examined by TEM under high magnification (~20,000x), using modified recording rules to allow for faster data reporting. In brief, the output of the analysis is a total structure count and a PCME structure count for each grid opening examined. All fibrous amphibole structures that have appropriate Selected Area Electron Diffraction (SAED) patterns and Energy-dispersive X-ray (EDXA) spectra, and having length ≥ 0.5 um and an aspect ratio (length: width) ≥ 3:1, should be included in the total structure count. All structures meeting appropriate SAED and EDXA requirements, and having a length > 5 um, a width ≥ 0.25 um, and an aspect ratio ≥ 3:1, should be included in the PCME structure count. Structure counts for each grid opening should be recorded on the benchsheet and entered into the electronic data deliverable (EDD) spreadsheet. Raw structure data reporting (i.e., structure attributes and dimensions) is not required. If observed, chrysotile structures should be recorded using the same procedures described above, but structure recording may stop after 25 chrysotile structures have been observed.

B4.1.2 Stopping Rules

Appendix A provides detailed information on the derivation of the stopping rules for air field samples analyzed by TEM. The stopping rules are as follows:

1. Count a minimum of two grid openings (GOs) from each of two grids.
2. Continue counting until one of the following is achieved:
   a. A target analytical sensitivity (0.0007 cc^{-1}) is achieved.
   b. 50 LA structures are observed
   c. An area of 1.0 mm^2 has been examined (approximately 100 GOs)

When one of these criteria has been satisfied, complete the examination of the final grid opening and stop.

For lot blanks and field blanks, the TEM analyst should examine an area of 0.1 mm^2 (approximately 10 GOs) and stop.

B4.2 Data Reporting

In the field, sample details and COC information will be documented on hard copy FSDS forms, field logbooks, and COC forms. Copies of all FSDS forms, field logbooks, and COC forms will be scanned and posted in portable document format (pdf) to the Libby OU3 eRoom at the end of each fire event. This eRoom has controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names

for scanned documents will include the sample date in the format MMDDYY to facilitate document organization (e.g., "FSDS_083109.pdf").

TEM results will be reported and results transmitted (including the detailed raw structure data from the TEM analysis) within 24 hours of sample receipt by the laboratory. All TEM results[6] will be submitted using the most recent version of the Rapid TEM EDD for air samples in use at the Libby site. Standard project data reporting requirements will be met for this dataset.

Upon completion of the appropriate analyses, EDDs will be posted to the Libby OU3 eRoom within the appropriate turn-around time. Hard copies of all analytical laboratory data packages will be scanned and posted as a pdf file to the Libby OU3 eRoom. File names for scanned analytical laboratory data packages will include the laboratory name and the job number to facilitate document organization (e.g., LabX_12345-A.pdf). All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA.

B4.3 Analytical Turn-around Time

As noted above, TEM results will be reported and results transmitted within 24 hours of sample receipt by the laboratory.

B4.4 Custody Procedures

Specific laboratory custody procedures are provided in each laboratory's *Quality Assurance Management Plan*, which have been independently reviewed at the time of laboratory procurement. While specific laboratory sample custody procedures may differ between laboratories, the basic laboratory sample custody process is described briefly below.

Upon receipt at the facility, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC record will be cross-referenced with all of the samples in the shipment. The laboratory sample coordinator will sign the COC record and maintain a copy for their project files.

Depending upon the laboratory-specific tracking procedures, the laboratory sample coordinator may assign a unique laboratory identification number to each sample on the COC. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the responsibility of the laboratory manager to ensure that internal logbooks and records are maintained throughout sample preparation, analysis, and data reporting.

[6] The most current version of all EDDs are provided in the OU3 eRoom.

B5. QUALITY ASSURANCE/QUALITY CONTROL

B5.1 Field

Field QA/QC activities include all processes and procedures that have been designed to ensure that field samples are collected and documented properly, and that any issues/deficiencies associated with field data collection or sample processing are quickly identified and rectified. The following sections describe each of the components of the field QA/QC program implemented at the Site.

B5.1.1 Training

Before performing field work in Libby, field personnel are required to read all governing field guidance documents relevant to the work being performed and attend a field planning meeting specific to the wildfire monitoring effort. Additional information on field training requirements is provided in Section A8.1.

B5.1.2 Modification Documentation

Minor deviations (i.e., those that will not impact data quality or usability) encountered in day-to-day field work will be noted in the field logbook. Major deviations from this SAP/QAPP that modify the sampling approach and associated guidance documents will be recorded on a field ROM form (see **Appendix G**). Field ROMs will be completed by the FTL, or by assigned field or technical staff. Each completed ROM is assigned a unique number that is specific to each investigation (e.g., Wildfire LFM-OU3-01) by the EPA RPM or their delegate. Once a form is prepared, it is submitted to the EPA RPM for review and approval. Copies of approved field ROMs are available in the OU3 eRoom and are posted to the OU3 website.

B5.1.3 Field QC Samples

<u>Air</u>

Two types of field QC samples will be collected as part of the air sampling portion of this program – lot blanks and field blanks.

Lot Blanks
Lot blanks are collected to ensure air samples for asbestos analysis are collected on asbestos-free filters. This will be accomplished by selecting 2 lot blanks at random from the group of cassettes (manufactured lot) to be used for collection of air samples. It is the responsibility of the FTL to submit the appropriate number of lot blanks to the laboratory prior to cassette use in the field. Each lot blank will be analyzed for asbestos by TEM analysis as described above (see Section B4.1). Lot blank results will be reviewed by the FTL before any cassette in the lot is used for

sample collection. The entire batch of cassettes will be rejected if any asbestos is detected on either lot blank. Once the lot is confirmed to be asbestos free (i.e., asbestos is not detected on either lot blanks), that lot may be placed into use for sampling. Only filter lots with acceptable lot blank results are placed into use for the ambient air sampling effort.

Field Blanks

Field blanks are collected to evaluate potential contamination introduced during sample collection, shipping and handling, or analysis. It is the responsibility of each field team to collect the appropriate number of field blanks. A field blank for air shall be prepared by removing the sampling cassette from the box, opening the cassette to the air in the area where the investigative samples will be taken for about 30 seconds, then closing the cassette and packaging for shipment and analysis. Field blanks will be collected at a rate of 1 blank for every 2 days of sampling that occurs. The field blanks are analyzed for asbestos by TEM analysis as described above (see Section B4.1).

If any asbestos is observed on a field blank, the FTL and/or laboratory manager will be notified and will take appropriate measures (e.g., re-training on sample collection and analysis procedures) to ensure staff are employing proper sample handling techniques. In addition, a qualifier of "FB" will be added to the related field sample results in the project database to denote that the associated field blank had asbestos structures detected.

Field Duplicates

A field duplicate air sample shall be collected at the downwind mobile monitoring station at the rate of 1 field duplicate for every 2 days of sampling that occurs. The field duplicate is co-located (both in space and time) with the parent sample and is collected using the same collection technique as the parent sample. It is the responsibility of the FTL to ensure that the field duplicate is collected. The field duplicate is given unique sample number, and field personnel will record the sample number of the associated co located sample in the parent sample number field of the FSDS. The same station location is assigned to the field duplicate sample as the parent field sample. Field duplicates will be sent for analysis by the same method as field samples and are blind to the analytical laboratories (i.e., the laboratory cannot distinguish between field samples and field duplicates).

Field duplicate results will be compared to the original parent field sample using the Poisson ratio test using a 90% confidence interval (Nelson 1982). Because field duplicate samples are expected to have inherent variability that is random and may be either small or large, typically, there is no quantitative requirement for the agreement of field duplicates. Rather, results are used to determine the magnitude of this variability to evaluate data usability.

B5.2 Laboratory

Laboratory QA/QC activities include all processes and procedures that have been designed to ensure that data generated by an analytical laboratory are of high quality and that any problems in sample preparation or analysis that may occur are quickly identified and rectified. The following sections describe each of the components of the analytical laboratory QA/QC program implemented at the Site.

B5.2.1 Training/Certifications

All analytical laboratories participating in the analysis of samples for the Libby project are subject to national, local, and project-specific certifications and requirements. Additional information on laboratory training and certification requirements is provided in Section A8.2.

Laboratories handling samples collected as part of this sampling program will be provided a copy of and will adhere to the requirements of this SAP/QAPP. Samples collected under this SAP/QAPP will be analyzed in accordance with standard EPA and/or nationally-recognized analytical procedures (i.e., Good Laboratory Practices) in order to provide analytical data of known quality and consistency.

B5.2.2 Modification Documentation

When changes or revisions are needed to improve or document specifics about analytical methods or procedures used by the laboratory, these changes are documented using a laboratory ROM form (see **Appendix G**). The laboratory ROM form provides a standardized format for tracking procedural changes in sample analysis and allows project managers to assess potential impacts on the quality of the data being collected. Laboratory ROMs will be completed by the appropriate laboratory or technical staff. Once a form is prepared, it is submitted to the EPA RPM and the LC for review and approval. Copies of approved laboratory ROMs are available in the Libby Lab eRoom.

B5.2.3 Laboratory QC Analyses

The Libby-specific QC requirements for TEM analyses of asbestos are patterned after the requirements set forth by NVLAP. In brief, there are three types of laboratory-based QC analyses that are performed for TEM – laboratory blanks, recounts, and repreparations. Detailed information on the Libby-specific requirements for each type of TEM QC analysis, including the minimum frequency rates, selection procedures, acceptance criteria, and corrective actions are provided in the most recent version of Libby Laboratory Modification LB-000029, with the following investigation-specific modifications:

- Laboratory QC sample frequency requirements should be applied on an OU3-specific and medium-specific basis, rather than "across all media" as specified in LB-000029.

- Because raw structure data are not recorded as part of the rapid TEM analysis, recount analyses cannot be evaluated with respect to the structure-specific concordance requirements; only GO-specific concordance requirements will be evaluated.

- Inter-laboratory analyses should be performed at a minimum frequency of 10% and repreparations at a minimum frequency of 4%.

With the exception of inter-laboratory analyses, it is the responsibility of the laboratory manager to ensure that the proper number of TEM QC analyses are completed. The LC will provide the list of selected inter-laboratory analyses to the laboratory manager and will facilitate the exchange of samples between the analytical laboratories.

In addition to the above TEM QC, as appropriate, the laboratories may also evaluate drying blank samples. Based on observations from long-duration sampling events (i.e., 24-hour samples), moisture inside the sample cassettes due to meteorological conditions (e.g., rain, fog) can promote biological growth on sample filters. The occurrence of biological growth can interfere with direct sample preparation methods. As a result, when filter conditions warrant, the laboratory may oven-dry the sets of sample cassettes prior to preparation for analysis. A drying blank is a filter that is dried in the same oven at the same time as the field sample lot. Drying blanks are used to determine if the drying process is a potential source of contamination to field samples. The drying blanks are analyzed for asbestos by the same method that is used for field blanks and lot blanks.

B6/B7. EQUIPMENT MAINTENANCE AND INSTRUMENT CALIBRATION

B6/B7.1 Field Equipment

B6/B7.1.1 Field Equipment Maintenance

All field equipment (e.g., GPS units) should be maintained and calibrated in basic accordance with manufacturer specifications. When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled "out of order" and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as "out of order" will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the "out of order" equipment. This may include having appropriately trained field team members complete the repair or shipping the malfunctioning equipment to the manufacturer. Field team members will have access to basic tools required to make field acceptable repairs. This will ensure timely repair of any "out of order" equipment.

B6/B7.1.2 Air Sampling Pump Calibration

As noted previously, each air sampling pump will be calibrated at the start of the sampling period each day using the primary calibrator (BIOS Drycal). For pre-sampling purposes, calibration will be considered complete when the measured flow is within ±5% of the target flow, as determined by the mean of three measurements. Each BIOS Drycal used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag.

B6/B7.2 Laboratory Instruments

The laboratory manager is responsible for ensuring that all laboratory instruments used for this project are maintained and calibrated in accordance with the manufacturer's instructions. If any deficiencies in instrument function are identified, all analyses shall be halted until the deficiency is corrected. The laboratory shall maintain a logbook that documents all routine maintenance and calibration activities, as well as any significant repair events, including documentation that the deficiency has been corrected.

B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

B8.1 Field Supplies

In advance of field activities, the FTL will check the field equipment/supply inventory and procure any additional equipment and supplies that are needed. The FTL will also ensure any in-house measurement and test equipment used to collect data/samples as part of this SAP/QAPP is in good, working order, and any procured equipment is acceptance tested prior to use. Any items that the FTL determines unacceptable will be removed from inventory and repaired or replaced as necessary.

Because fires occur at random times and response to a fire event must be immediate, all preparations for sampling must be completed in advance of fire events. This shall include preparing and having ready for immediate use the following items:

- Air pumps and primary calibrator (BIOS Drycal). Each air sampling pump used for this activity shall be maintained to ensure the battery is fully charged. The pump shall be checked weekly, each time calibrating to a flow rate of 5 liters/min. Documentation of the calibration events shall be maintained in a logbook.

- Filter cassettes. A supply of filter cassettes (minimum of 20) shall be maintained in plastic zip-top bags ready for immediate use. Note that cassettes shall not be considered for field use until a lot blank has been analyzed and determined to be free of fibers.

- Field Documentation Supplies. All supplies needed to document sampling at a fire event shall be prepared ahead of time and be ready for use. This shall include one clipboard per person. Each clipboard shall include the following:
    - A minimum of three FSDS sheets
    - A minimum of 20 self-adhesive sample ID labels (3 labels per sample)
    - One indelible pen

- Safety equipment. All safety equipment (e.g., hard hat, respiratory protection, Nomax personal protective equipment, water bottles, flashlight, first aid kit, etc.) shall be prepared and located in a readily accessible area for immediate use.

- Anemometer and compass. Each team shall take a hand-held anemometer and a compass to each fire event to help collect data on wind speed and direction. These shall be prepared and placed in a plastic zip-top bag that is ready for immediate use.

- GPS unit. Each team shall take a GPS unit to each fire event to record the location of the ambient air sampling.

B8.2 Laboratory Supplies

The laboratory manager is responsible for ensuring that all reagents and disposable equipment used in this project is free of asbestos contamination. This is demonstrated by the collection of laboratory blank samples (see Section B5).

B9. NON-DIRECT MEASUREMENTS

There are no non-direct measurements that are anticipated for use in this project.

B10. DATA MANAGEMENT

All data generated as part of the contingency air monitoring plan will be maintained in an OU3-specific Microsoft Access® database in accordance with the OU3-specific data management procedures specified below. The following sections provide a brief overview of the roles and responsibilities for data management and a summary of the data storage requirements for the OU3 project.

B10.1 Roles and Responsibilities

B10.1.1 Field Personnel

Remedium Group, Inc. contractors will perform all sample collection in accordance with this SAP/QAPP. In the field, sample details will be documented on hard copy media-specific FSDS forms and in field logbooks. COC information will be documented on hard copy forms.

Because of the opportunistic nature of this sampling program, entry of FSDS forms and COC information into the master OU3 project database will be completed by the OU3 data manager (CDM Smith) on a weekly basis when sampling is occurring. The field teams are responsible for scanning and posting (as a .pdf) copies of all FSDS forms, COC forms, and field logbooks to the OU3 eRoom on a weekly basis when sampling is occurring. This eRoom has controlled access (i.e., user name and password are required) to ensure data access is limited to appropriate project-related personnel. File names for scanned FSDS forms, COC forms, and field logbooks will include the sample date in the format YYYYMMDD to facilitate document organization (e.g., FSDS_20110412.pdf). Electronic copies of all digital photographs and videos will also be posted weekly to the OU3 eRoom.

B10.1.2 Laboratory Personnel

Each of the laboratories performing asbestos analyses for this investigation are required to utilize all applicable Libby-specific Microsoft Excel® EDD spreadsheets for asbestos data recording and electronic submittals. Upon completion of the appropriate analyses, EDDs and scanned copies of all analytical laboratory data packages will be posted to the OU3 eRoom.

B10.1.3 Database Administrators

Day-to-day operations of the master OU3 project database will be under the control of EPA contractors. The primary database administrator (CDM Smith) will be responsible for sample tracking, entering new field data, uploading new analytical data, performing error checks, and making any necessary data corrections. New records will be added to the master OU3 project database within an appropriate time period of data receipt.

B10.2 Master OU3 Project Database

The master OU3 project database is a relational Microsoft Access® database developed specifically for OU3. The *Libby OU3 Database User's Guide* provides an overview of the master OU3 project database structure and content. The most recent version of this *User's Guide* is provided on the OU3 website.

The master OU3 project database is kept on the CDM Smith server in Denver, Colorado. Incremental backups of the master OU3 project database are performed daily Monday through Friday, and a full backup is performed each Saturday.

B10.3 Data Reporting

Field summary reports are prepared by Remedium's field collection contractor. Analytical results summaries are included in the OU3 investigation-specific SAPs and will be provided in the *OU3 Data Summary Report* (currently in preparation), which are available on the OU3 website. A field summary report will be prepared for data that are collected during a wildfire and the data will also be summarized in an addendum to the *OU3 Data Summary Report.* Specialized requests for data summaries may be submitted to the EPA RPM.

B10.4 Data Storage

All original data records (both hard copy and electronic) will be cataloged and stored in their original form until otherwise directed by the EPA RPM. At the termination of this project, all original data records will be provided to the EPA RPM for incorporation into the Site project files.

C Assessment and Oversight

C1. ASSESSMENT AND RESPONSE ACTIONS

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities.

C1.1 Assessments

C1.1.1 Field Oversight

Field oversight activities may be conducted by HDR Engineering, Inc. at the request of EPA. However, due to the nature of this sampling effort, it may not be possible to perform formal field audits based on safety considerations and the time needed to mobilize non-local oversight support.

Even if a formal field audit cannot be performed, the field QAM will perform periodic field surveillances to evaluate field staff adherence to investigation-specific governing documents. The schedule for performing field surveillances depends on the duration of the investigation, frequency of execution, and magnitude of process changes. Usually, field surveillances are performed at the beginning of a field investigation to ensure that any potential issues are identified and addressed early, thus reducing the potential for data quality issues. Surveillances will be conducted as necessary when field processes are revised or other QA/QC procedures indicates the possibility of deficiencies. When deficiencies are observed during the surveillances, the field QAM will immediately discuss the observation with the field team member and coordinate corrective measures with the FTL, if required. If the observer finds deficiencies across multiple field team members or teams, the FTL will plan and hold a field meeting. At this meeting, the observations made will be discussed and any corrective actions required (e.g., retraining) will be reviewed.

C1.1.2 Laboratory Oversight

Each laboratory working on the Libby project is required to participate in an annual on-site laboratory audit carried out by the EPA through the QATS contract. These audits are performed by EPA personnel (and their contractors), that are external to and independent of, the Libby team members. These audits ensure that each analytical laboratory meets the basic capability and quality standards associated with analytical methods for asbestos used at the Libby site. They also provide information on the availability of sufficient laboratory capacity to meet potential testing needs associated with the Site.

External Audits

Audits consist of several days of technical and evidentiary review of each laboratory. The technical portion of the audit involves an evaluation of laboratory practices and procedures associated with the preparation and analysis of samples for the identification of asbestos. The evidentiary portion of the audit involves an evaluation of data packages, record keeping, SOPs, and the laboratory's *QA Management Plan*. A checklist of method-specific requirements for the commonly used methods for asbestos analysis is prepared by the auditor prior to the audit, and used during the on-site laboratory evaluation.

Evaluation of the capability for a laboratory to analyze a sample by a specific method is made by observing analysts performing actual sample analyses and interviewing each analyst responsible for the analyses. Observations and responses to questions concerning items on each method-specific checklist are noted. The determination as to whether the laboratory has the capability to analyze a sample by a specific method depends on how well the analysts follow the protocols detailed in the formal method, how well the analysts follow the laboratory-specific method SOPs, and how the analysts respond to method-specific questions.

Evaluation of the laboratory to be sufficient in the evidentiary aspect of the audit is made by reviewing laboratory documentation and interviewing laboratory personnel responsible for maintaining laboratory documentation. This includes personnel responsible for sample check-in, data review, QA procedures, document control, and record archiving. Certain analysts responsible for method quality control, instrument calibration, and document control are also interviewed in this aspect of the audit. Determination as to the capability to be sufficient in this aspect is made based on staff responses to questions and a review of archived data packages and QC documents.

It is the responsibility of the QATS contractor to prepare an On-site Audit Report for each analytical laboratory participating in the Libby program. These reports are handled as business confidential items. The On-site Audit Report includes both a summary of the audit results and completed checklist(s), as well as recommendations for corrective actions, as appropriate. Responses from each laboratory to any deficiencies noted in the On-site Audit Report are also maintained with the respective reports.

It is the responsibility of the QATS contractor to prepare an On-Site Audit Trend Analysis Report on an annual basis. This report shall include a compilation and trend analysis of the on-site audit findings and recommendations. The purpose of this reported is to identify common asbestos laboratory performance problems and isolate the potential causes.

Internal Audits

Each laboratory will also conduct periodic internal audits of their specific operations. Details on these internal audits are provided in the laboratory *QA Management Plan*. The laboratory QAM should immediately contact the LC and the QATS contractor if any issues are identified during internal audits that may impact data quality for OU3 samples.

C1.2 Response Actions

Corrective response actions will be implemented on a case-by-case basis to address quality problems. Minor actions taken to immediately correct a quality problem will be documented in the applicable field or laboratory logbooks and a verbal report will be provided to the appropriate manager (e.g., the FTL or LC). Major corrective actions will be approved by the EPA RPM and the appropriate manager prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation. The EPA RPM for OU3 will be notified when quality problems arise that that cannot be corrected quickly through routine procedures (contact information is provided below):

Christina Progess
U.S. EPA, Region 8
1595 Wynkoop Street
Denver, CO 80202
Tel: (303) 312-6009
Fax: (303) 312-7151
E-mail: progess.christina@epa.gov

In addition, when modifications to this SAP/QAPP are required, either for field or laboratory activities, a ROM must be completed and approved by the EPA RPM prior to implementation.

C2. REPORTS TO MANAGEMENT

No regularly-scheduled written reports to management are planned as part of this project. However, QA reports will be provided to management for routine audits and whenever quality problems are encountered. Field staff will note any quality problems on FSDSs or in field logbooks. Further, the field and laboratory managers will inform the EPA RPM upon encountering quality issues that cannot be immediately corrected. Weekly reports and change request forms are not required for work performed under this SAP/QAPP.

D Data Validation and Usability

D1. DATA REVIEW, VERIFICATION AND VALIDATION

D1.1 Data Review

Data review of project data typically occurs at the time of data reporting by the data users and includes cross-checking that sample IDs and sample dates have been reported correctly and that calculated analytical sensitivities or reported values are as expected. If discrepancies are found, the data user will contact the database manager (CDM Smith), who will then notify the appropriate entity (field or laboratory) in order to correct the issue.

D1.2 Criteria for LA Measurement Acceptability

Several factors are considered in determining the acceptability of LA measurements in samples analyzed by TEM. This includes the following:

1. *Evenness of filter loading.* This is evaluated using a chi-square (CHISQ) test, as described in ISO 10312 Annex F.2. If a filter fails the CHISQ test for evenness, the result may not be representative of the true concentration in the sample, and the result should be given low confidence.

2. *Results of QC samples.* This includes both field and laboratory QC samples, such as field and laboratory blank samples, as well as various types of recount and re-preparation analyses. If significant LA contamination is detected in field or laboratory blanks, all samples prepared on that day should be considered to be potentially biased high. If agreement between original analyses and re-preparation or recount analyses is poor, results for those samples should be given low confidence.

D2. VERIFICATION AND VALIDATION METHODS

D2.1 Data Verification

Data verification includes checking that results have been transferred correctly from the original hand-written, hard copy field and analytical laboratory documentation to the OU3 project database. The goal of data verification is to identify and correct data reporting errors.

For analytical laboratories that utilize the Libby-specific EDD spreadsheets, data checking of reported analytical results begins with automatic QC checks that have been built into the spreadsheets. In addition to these automated checks, a detailed manual data verification effort will be performed for 30% of all air samples. This data verification process utilizes Site-specific

SOPs developed to ensure TEM results and field sample information in the OU3 database is accurate and reliable:

- EPA-LIBBY-09 – *SOP for TEM Data Review and Data Entry Verification* – This Site-specific SOP describes the steps for the verification of TEM analyses, based on a review of the laboratory benchsheets, and verification of the transfer of results from the benchsheets into the project database.

- EPA-LIBBY-11 - *SOP for FSDS Data Review and Data Entry Verification* – This Site-specific SOP describes the steps for the verification of field sample information, based on a review of the FSDS form, and verification of the transfer of results from the FSDS forms into the project database. An FSDS review is performed on all samples selected for TEM data verification.

The data verification review ensure that any data reporting issues are identified and rectified to limit any impact on overall data quality. If issues are identified during the data verification, the frequency of these checks may be increased as appropriate.

Data verification will be performed by appropriate CDM Smith staff familiar with project-specific data reporting, analytical methods, and investigation requirements. The data verifier will prepare a data verification report (template reports are included in the SOPs) to summarize any issues identified and necessary corrections. A copy of this report will be provided to the appropriate project data manager, LC, and the EPA RPM. It is the responsibility of the OU3 database manager (CDM Smith) to coordinate with the FTL and/or LC to resolve any OU3 project database corrections and address any recommended field or laboratory procedural changes from the data verifier. The OU3 database manager is also responsible for electronically tracking in the project database which data have been verified, who performed the verification, and when.

D2.2 Data Validation

Unlike data verification, where the goal is to identify and correct data reporting errors, the goal of data validation is to evaluate overall data quality and to assign data qualifiers, as appropriate, to alert data users to any potential data quality issues. Data validation will be performed by the QATS contractor (or their designate), with support from technical support staff that are familiar with project-specific data reporting, analytical methods, and investigation requirements.

As part of the data validation effort, the QATS contractor will review results for all field QC samples and inter- and intra-laboratory QC analyses on a quarterly basis. In addition, the QATS contractor will also perform a formal data validation of the data packages submitted by

the laboratory in basic accordance with the draft *National Functional Guidelines for Asbestos Data Review* (EPA 2011b). This data validation includes an assessment of the following:

- Internal and external field audit/surveillance reports
- Field ROMs
- Field QC sample results
- Internal and external laboratory audit reports
- Laboratory contamination monitoring results
- Laboratory ROMs
- Internal laboratory QC analysis results
- Inter-laboratory analysis results
- Performance evaluation results
- Instrument checks and calibration results
- Data verification results (i.e., in the event that the verification effort identifies a larger data quality issue)

Because of the serious nature of a fire in OU3 and the high probability of the data being used to make important public health decisions by other agencies, data validation will be performed on 30% of all data packages submitted by the laboratory in support of this project.

Data validation results will be reported in a technical memorandum submitted quarterly to EPA. This technical memorandum shall detail the validation procedures performed and provide a narrative on the quality assessment for each type of asbestos analysis, including the data qualifiers assigned, and the reason(s) for these qualifiers. The technical memorandum shall detail any deficiencies and required corrective actions.

For OU3 reviews, electronic files summarizing the records that have been validated, the date they were validated, any recommended data qualifiers and their associated reason codes should be posted to the OU3 eRoom. It is the responsibility of the OU3 database manager (CDM Smith) to ensure that the appropriate data qualifiers and reason codes recommended by the data validator are added to the project database, and to electronically track in the project database which data have been validated, who performed the validation, and when.

In addition to performing quarterly data validation efforts, it is the responsibility of the QATS contractor (or their designate) to perform regular evaluations of all blanks, to ensure that any potential contamination issues are quickly identified and resolved. If any blank results are outside the acceptable limits, the QATS contractor should immediately contact the EPA RPM to ensure that appropriate corrective actions are made.

D3. RECONCILIATION WITH USER REQUIREMENTS

Once all samples have been collected and analytical data has been generated, data will be evaluated to determine if study objectives were achieved. It is the responsibility of data users to perform a data usability assessment to ensure that DQOs have been met, and reported investigation results are adequate and appropriate for their intended use. This data usability assessment should utilize results of the data verification and data validation efforts to provide information on overall data quality specific to each investigation.

The data usability assessment should evaluate results with regard to several data usability indicators, including precision, accuracy/ bias, representativeness, comparability, completeness, and whether specified analytic requirements (e.g., sensitivity) were achieved. **Table D-1** provides detailed information for how each of these indicators may be evaluated for the reported asbestos data. The data usability assessment results and conclusions should be included in any investigation-specific data summary reports.

Non-attainment of project requirements may result in additional sample collection or field observations in order to achieve project needs.

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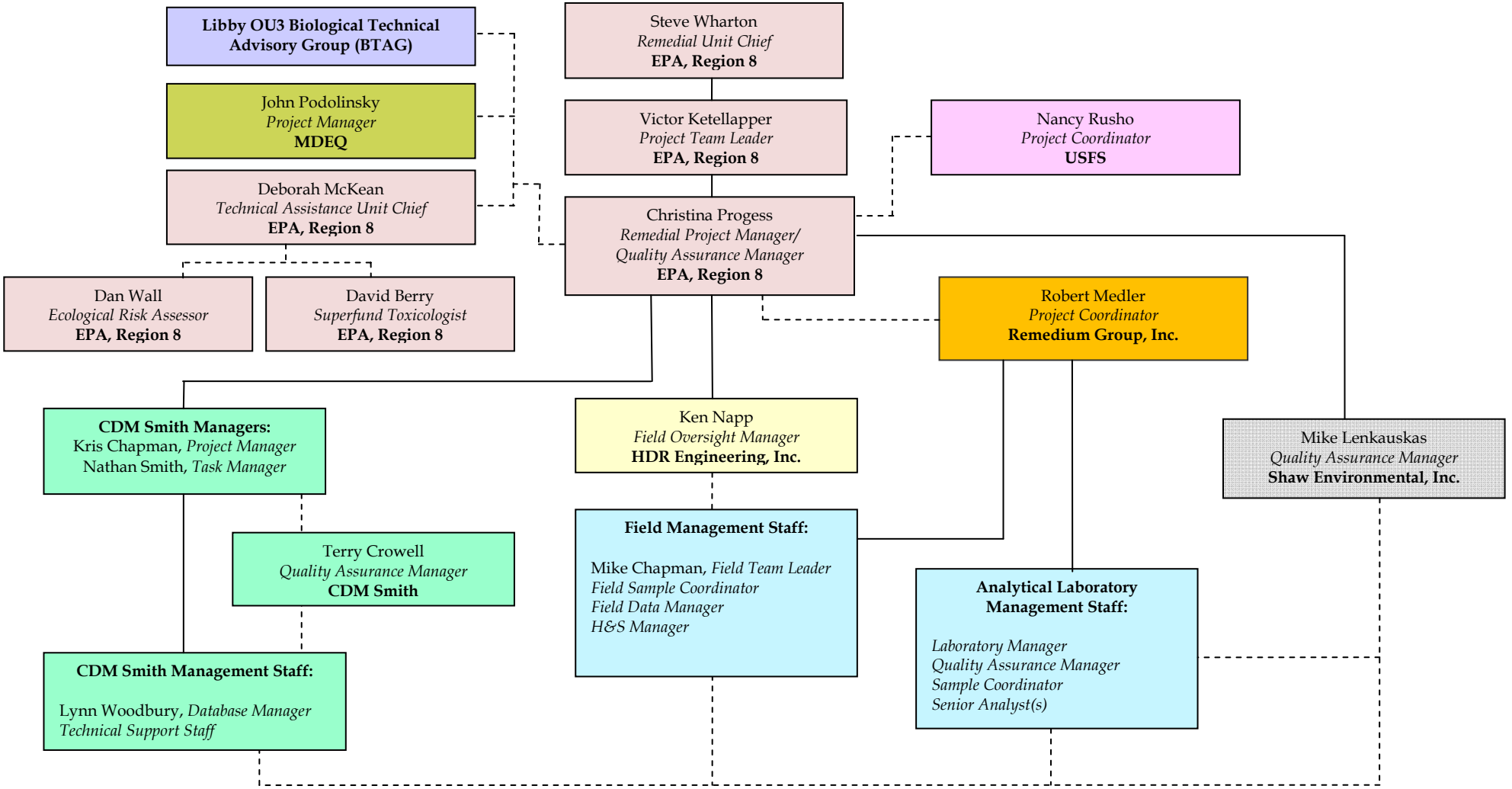

Figure A-1. General Organizational Chart for Libby OU3 Wildfire Contingency Air Monitoring Plan

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Libby Asbestos Superfund Site
Operable Unit 3 (Study Area)

OU 3 (Study Area) - Mine & Kootenai River

Date: October 7, 2010

Map Projection: UTM, Meters, Zone 11N, NAD83

Data Sources: *Operable Units* - U.S. EPA Region 8 (2010);
Imagery - 1-meter USDA NAIP (2009).

0 1 2 Miles

0 1 2 Kilometers

N

EPA REGION 8 serving the states & tribes of Colorado, Montana, Wyoming, Utah, North Dakota & South Dakota

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OU 3

2

Troy

Kootenai River

OU 3

2

Quartz Creek

Cedar Creek

Pipe Creek Rd

Kootenai River Rd

37

Kootenai River

OU 3

2

Purcell Creek

Flower Creek

Libby

Rainey Creek

OU 3

Lake Koocanusa

37

Kootenai River

2

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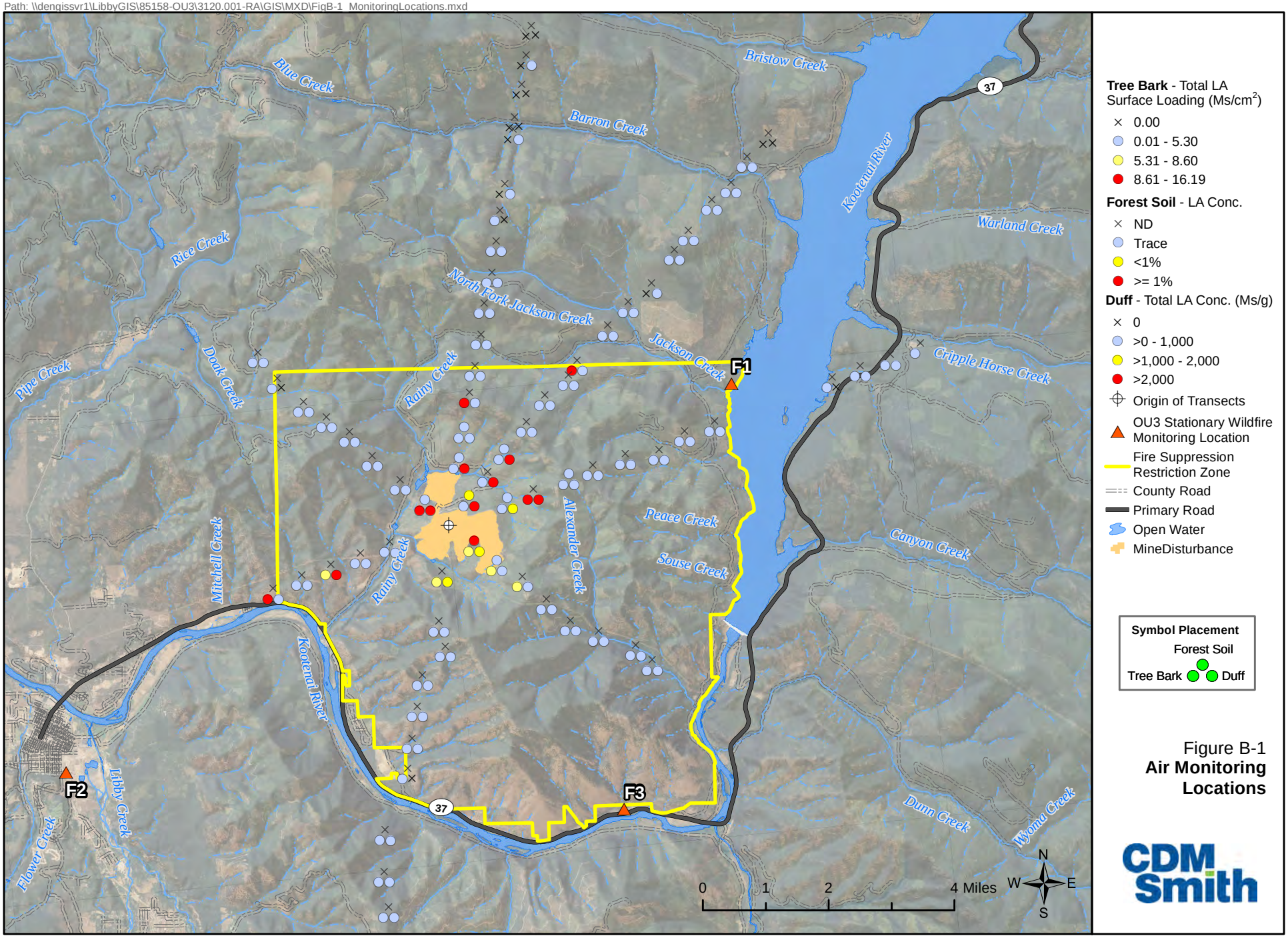

Figure B-1
Air Monitoring Locations

CDM Smith

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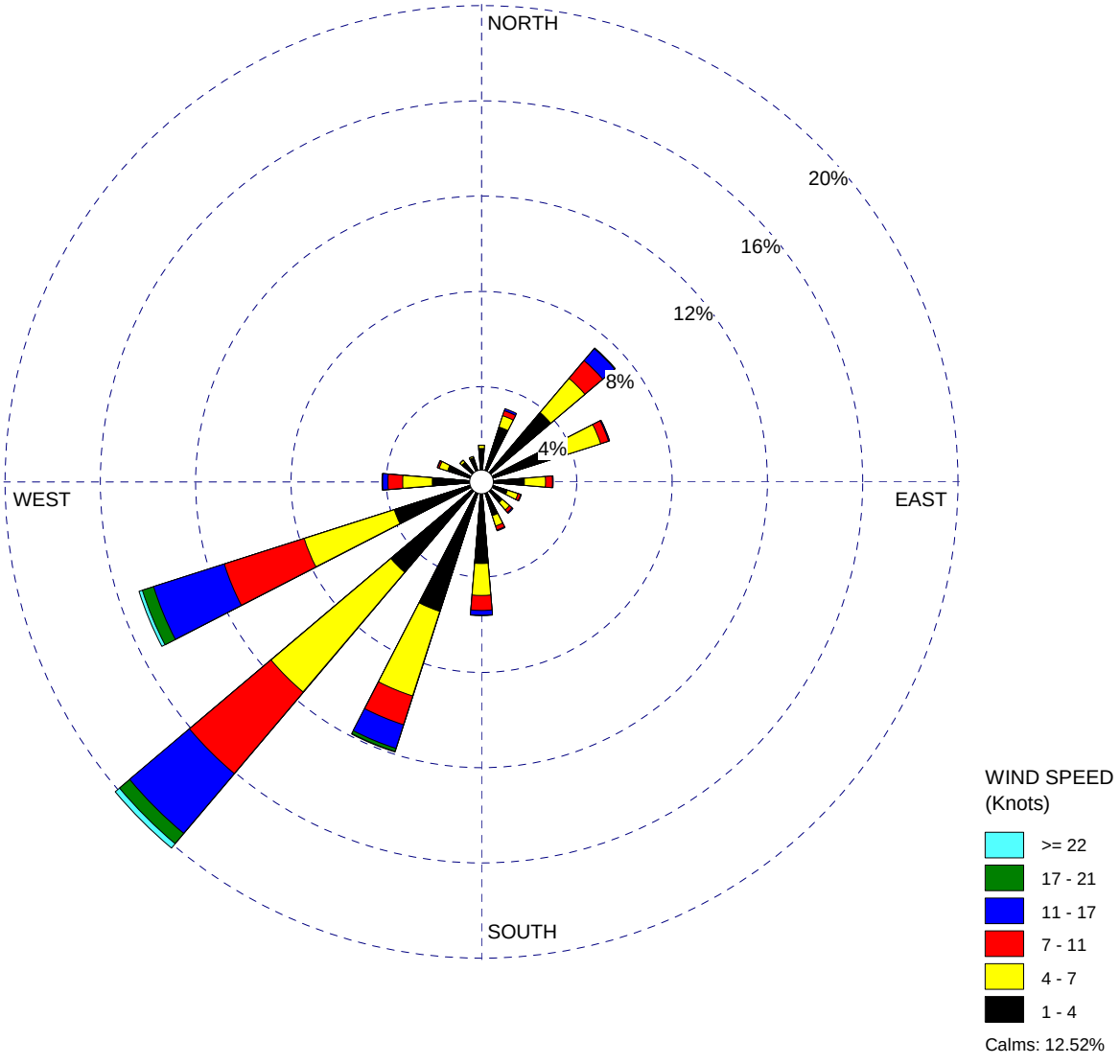
FIGURE B-2
WindRose for Zonolite Mountain, Libby, MT

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **2006-2009** **Jan 1 - Dec 31** **00:00 - 23:00**	COMPANY NAME: **W.R. Grace**	
		MODELER: **MWH Global**	MWH BUILDING A BETTER WORLD
	CALM WINDS: **12.52%**	TOTAL COUNT: **26272 hrs.**	
	AVG. WIND SPEED: **4.93 Knots**	DATE: **2/26/2010**	PROJECT NO.:

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TABLE D-1
DATA USABILITY INDICATORS FOR ASBESTOS DATASETS

Data Usability Indicator	General Evaluation Method
Precision	Sampling – Review results for co-located samples and field duplicates to provide information on variability arising from medium spatial heterogeneity and sampling and analysis methods. Analysis – Review results for TEM recounts and repreparations to provide information on variability arising from analysis methods. Review results for inter-laboratory analyses to provide information on variability and potential bias between laboratories.
Accuracy/Bias	Calculate the background filter loading rate and use results to assign detect/non-detect in basic accordance with ASTM 6620-00. For air samples, determine the frequency of indirect preparation.
Representativeness	Review relevant field audit report findings and any field/laboratory ROMs for potential data quality issues.
Comparability	Compare the sample collection SOPs, preparation techniques, and analysis methods to previous investigations.
Completeness	Determine the percent of samples that were able to be successfully collected and analyzed (e.g., 99 of 100 samples, 99%).
Sensitivity	Determine the fraction of all analyses that stopped based on the area examined stopping rule (i.e., did not achieve the target sensitivity).

ASTM = American Society of Testing and Materials
LA = Libby amphibole
QATS = Quality Assurance Technical Support
ROM = record of modification
SOP = standard operating procedure
TEM = transmission electron microscopy

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APPENDIX A

DATA QUALITY OBJECTIVES FOR THE OU3 WILDFIRE CONTINGENCY AIR MONITORING PLAN

Data Quality Objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data to be collected. The following sections implement the seven-step DQO process (EPA 2006) for the contingency air monitoring plan.

Step 1: State the Problem

The Phase I remedial investigation for Operable Unit 3 (OU3) of the Libby Asbestos Superfund Site included collection of data on levels of LA in tree bark, duff, and forest soils within the Kootenai National Forest surrounding the mined area. The Phase I data indicate that LA was detected by polarized light microscopy (PLM) in soil at distances up to 2 miles from the mine in the downwind direction. LA was detected by transmission electron microscopy (TEM) in samples of tree bark and duff in downwind, cross wind, and upwind directions at distances from 3 to 7.5 miles from the mine. There was general tendency for the highest levels detected in tree bark, duff, and soil samples to occur within about 2 to 3 miles of the mined area.

As stated in the *Framework for Investigating Asbestos-Contaminated Superfund Sites* (EPA 2008d), asbestos fibers in source materials are typically not inherently hazardous, unless the asbestos is released from the source material into air where it can be inhaled. If inhaled, asbestos fibers can increase the risk of developing lung cancer, mesothelioma, pleural fibrosis, and asbestosis. Thus, the evaluation of risks to humans from exposure to asbestos is most reliably achieved by the collection of data on the level of asbestos in breathing zone air. Forest fires may result in disturbance of asbestos source materials releasing them to the air; therefore ambient air monitoring sampling will be conducted to evaluate potential exposure for people in OU3.

Step 2: Identify the Goal of the Study

The key data quality objective for air samples collected under this project is to collect data that may be used to estimate exposure to residents and workers in Libby in the event that a wildfire in OU3 generates significant levels of smoke in the community. The EPA will use the exposure assessment in an evaluation of potential risks to human health. The risk assessment will support decisions about whether or not response actions are needed to protect humans from unacceptable risks from LA in air that are attributable to wildfires in OU3.

Step 3: Identify Information Inputs

The principal type of data needed to characterize exposure of individuals to LA in air during a wildfire in OU3 consists of reliable and representative measurements of LA in air as a function

of both time and space. Such measurements are obtained by drawing a known volume of air through a filter in areas affected by smoke from a forest fire and measuring the number of LA fibers that become deposited on the filter surface. This objective will be achieved by collecting two types of data – stationary air samples in the community of Libby and mobile air samples downwind of the wildfire.

1. Stationary air samples will be collected in and about the community of Libby when smoke from a fire in OU3 is reaching the community. This type of data provides a direct measure of human exposure to LA in smoke. However, collection of these data is contingent upon the occurrence of a fire in OU3 that generates smoke that reaches the community.

2. Air samples will be collected downwind of the fire (regardless of the direction that smoke is blowing). These data are valuable because the measured levels of LA in smoke can be used to model (predict) the levels of LA that would occur in Libby if the smoke were to be blown toward the community.

In addition, data on wind speed and direction are needed in order to help evaluate the collected air data.

Analysis Method

Air samples should be analyzed for asbestos using TEM. For ABS air samples, because asbestos toxicity depends on the particle size and mineral type, results should include the size attributes (length, width) of each asbestos structure observed, along with the mineral classification (LA, other amphibole, chrysotile).

Step 4: Define the Bounds of the Study

Spatial Bounds

Air monitoring data should be collected from locations surrounding OU3, selected to be representative of areas with a high potential for human exposure to smoke from wildfires within OU3. The strategy for selection of sampling locations is based mainly on selecting areas that would be representative of residential exposure. Stationary air samples should be collected in and about the community of Libby when smoke from a fire in OU3 is reaching the community. In addition, air samples should be collected downwind of the fire (regardless of the direction that smoke is blowing).

Temporal Bounds

Because the goal of the study is to monitor ambient air during authentic wildfires, there are no established temporal bounds. That is, samples will be collected whenever significant wildfires occur in OU3. Based on USFS records, fires are most likely to occur during the dry summer months (typically July, August, and September).

Step 5: Define the Analytic Approach

The decision that EPA must make is what response actions, if any, are needed to protect human receptors from unacceptable risks from asbestos in ambient air resulting from a wildfire in OU3. The EPA has not formally specified the criteria that will be used to determine if it is necessary to evaluate response actions (e.g., evacuate residents) to address potential releases of LA into ambient air from wildfires. If the level of LA in smoke is below a level of health concern, then it is not expected that response actions will be required. If the level of LA in smoke approaches or exceeds a level of health concern, then potential response actions (e.g., evacuation of residents) will be evaluated.

Air monitoring results may also be used to estimate an exposure point concentration (EPC). This EPC will be combined with assumptions about exposure frequency and duration and toxicity factors for LA that is expected to provide a basis for the EPA to determine, in consultation with MDEQ, whether response action is needed within OU3 to protect human health.

The EPA has recently proposed LA-specific toxicity values for use in estimating cancer risks and non-cancer hazard quotients (HQs) from exposures to LA in air. The lifetime inhalation unit risk (IUR) value is 0.17 LA phase contrast microscopy (PCM)[7] (structures per cubic centimeter [s/cc])$^{-1}$ and the lifetime reference concentration (RfC) value is 0.00002 LA PCM s/cc (EPA 2011). The EPA is currently reviewing these values. Basic methods for estimating human health risk from LA in air are provided below.

Estimation of Cancer Risk

The basic equation for estimating cancer risk from LA using the LA-specific IUR value is as follows:

$$Risk = EPC * TWF_c * IUR_{LA}$$

[7] Calculations of human exposure and risk from asbestos in air are expressed in terms of PCM s/cc. When analysis is performed by TEM, structures that satisfy PCM counting rules are referred to as PCM-equivalent (PCME) structures. The PCM counting rules include structures with a length > 5 microns (μm), a width greater than or equal to (≥) 0.25 um, and an aspect ratio ≥ 3:1.

where:

Risk = Lifetime excess risk of developing cancer (lung cancer or mesothelioma) as a consequence of site-related LA exposure.

EPC = Exposure point concentration of LA in air (PCM or PCM-equivalent [PCME] s/cc). The EPC is an estimate of the long-term average concentration of LA in inhaled air for the specific activity being assessed.

TWF_c = Time-weighting factor for cancer. The value of the TWF term ranges from zero to one, and describes the average fraction of a lifetime during which exposure occurs from the specific activity being assessed. Because the IUR incorporates a lag of 10 years, the duration of a lifetime is assumed to be 60 rather than the usual 70 years:

TWF = ET/24 * EF/365 * ED/60

where:

ET = Average exposure time (hrs/day)
EF = Average exposure frequency (days/year)
ED = Exposure duration (years)

IUR_{LA}= LA-specific lifetime inhalation unit risk (LA PCM s/cc)$^{-1}$

Estimation of Non-Cancer Hazard Quotient

The basic equation for characterizing non-cancer risk from LA using the LA-specific RfC value is as follows:

$HQ = EPC * TWF_{nc} / RfC_{LA}$

where:

HQ = Hazard quotient for non-cancer effects from site-related LA exposure

EPC = Exposure point concentration of LA in air (PCM or PCME s/cc)

TWF_{nc} = Time-weighting factor for non-cancer, which is calculated as:

TWF = ET/24 * EF/365 * ED/70

where:

ET = Average exposure time (hrs/day)

EF = Average exposure frequency (days/year)

ED = Exposure duration (years)

RFC_{LA} = LA-specific lifetime reference concentration (LA PCM s/cc)

Decision Rule

The EPA guidance provided in OSWER Directive #9355.0-30, "*Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*" (EPA 1991) indicates that if the cumulative cancer risk to an individual based on reasonable maximum exposure (RME) is less than 1E-04 and the non-cancer HQ is less than 1, then remedial action is generally not warranted unless there are adverse environmental impacts. The guidance also states that a risk manager may decide that a risk level lower than 1E-04 is unacceptable and that remedial action is warranted where there are uncertainties in the risk assessment results.

Step 6: Specify Performance Criteria

In making decisions about the risks to humans, two types of decision errors are possible:

- A *false negative decision error* would occur if a risk manager decides that exposure to LA is not of health concern, when in fact it is of concern.

- A *false positive decision error* would occur if a risk manager decides that exposure to LA is above a level of concern, when in fact it is not.

The EPA is most concerned about guarding against the occurrence of false negative decision errors, since an error of this type may leave humans exposed to unacceptable levels of LA. To minimize chances of underestimating the true amount of exposure and risk, the EPA generally recommends that risk estimations be based on the 95 percent upper confidence limit (95UCL) of the sample mean (EPA 1992). Use of the 95UCL in risk calculations limits the probability of a false negative decision error to no more than 5 percent. To support this approach, the EPA has developed a software application (ProUCL) to assist with the calculation of 95UCL values (EPA 2010b). However, equations and functions in ProUCL are not designed for asbestos datasets and application of ProUCL to asbestos datasets is not recommended (EPA 2008c). The EPA is presently working to develop a new software application that will be appropriate for use with asbestos datasets, but the application is not yet available for use. Because the 95UCL cannot presently be calculated with confidence, EPCs will be based on the sample mean only, as

recommended by EPA (2008c). This means that resulting risk estimates may be either higher or lower than true values, and this will be identified as a source of uncertainty in the risk assessment.

The EPA is also concerned with the probability of making false positive decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. The risk of false positive decision errors can be minimized by increasing the number of samples. However, due to the opportunistic nature of this sampling program, the number of samples that will be collected cannot be controlled and will depend upon the frequency and duration of authentic wildfires in OU3.

Step 7: Develop the Plan for Obtaining Data

A detailed study design for the collection of ambient air monitoring data in OU3 is provided in Section B1 of this SAP/QAPP. Key features of this study design are discussed below.

Selection of Sampling Location

The plan is to sample air at several fixed stationary air monitoring stations surrounding OU3. These fixed stationary air monitoring stations are located at the camping area at McGillivray Access, the Libby CDM Smith office, and at the U.S. Forest Service Canoe Gulch Ranger Station along Highway 37. In addition, one mobile air monitoring station will be deployed downwind of the fire. Air sampling at the three fixed monitoring stations will not occur except during times that a fire is burning in OU3, and smoke from the fire is reaching the vicinity of one or more of the fixed monitors. [Note: This may include any controlled burns conducted by the USFS, as may be appropriate.] If deemed necessary to support risk management decisions, additional air monitoring locations may be warranted.

Optimizing the Sample Collection Strategy

Key variables that may be adjusted during collection of air samples are sampling duration and pump flow rate. The product of these two variables determines the amount of air drawn through the filter, which in turn is an important factor in the analytical cost and feasibility of achieving the target analytical sensitivity (TAS). In general, longer sampling times are preferred over shorter sampling times because a) longer time intervals are more likely to yield representative measures of the average concentration (as opposed to short-term fluctuations), and b) longer collection times are associated with higher volumes, which makes it easier to achieve the TAS. Likewise, higher flow rates are generally preferred over lower flow rates because high flow results in high volumes drawn through the filter over shorter sampling times.

However, there is a limit to how much air can be drawn through a filter. In cases where the air being sampled contains a significant level of airborne particulates, it is possible that particulate

loading on the filter could influence the ability to maintain the optimal flow rate. To minimize this possibility, pump flow rates should be checked regularly throughout the collection period and filter cassettes should be changed if flow rates become impacted.

Analytical Requirements for Air Samples

In general, three alternative stopping rules are specified for TEM analyses to ensure resulting data are adequate:

1. The TAS to be achieved
2. A maximum number of structures to be counted
3. A maximum area of filter to be examined

The basis for each of these values for this study is presented below.

Target Analytical Sensitivity

The level of analytical sensitivity needed to ensure that analysis of air samples will be adequate is derived by finding the concentration of LA in air that might be of potential concern, and then ensuring that if an air sample were encountered that had a true concentration equal to that level of concern, it would be quantified with reasonable accuracy. This process is implemented below:

Step 1. Calculation of Risk-Based Concentrations

Cancer. The basic equation for calculating the risk-based concentration (RBC) for cancer is:

$$RBC(cancer) = \text{Maximum Acceptable Cancer Risk} / (TWF_c * IUR)$$

For cancer, the maximum acceptable risk is a risk management decision. For the purposes of calculating an adequate TAS, a value of 1E-05 is assumed.

The exposure parameters needed to calculate TWF are not known with certainty, so the following RME exposure parameters were selected based on professional judgment:

Exposure Parameter	Selected Value
Exposure Time	24 hours/day
Exposure Frequency	10 days/year (5 fires/year lasting 2 days each)
Exposure Duration	40 years

Based on these exposure parameters, the TWF_c is 0.0157 (24/24 * 10/365 * 40/70 = 0.0157). Thus, the RBC for cancer is 0.0038 LA PCME s/cc.

Non-Cancer. The basic equation for calculating the RBC for non-cancer effects is:

RBC(non-cancer) = (Maximum Acceptable HQ * RfC) / TWF_{nc}

For non-cancer, the maximum acceptable HQ is 1. Based on the exposure parameters presented above, the TWF_{nc} is 0.0183 (24/24 * 10/365 * 40/60 = 0.0183). Thus, the RBC for non-cancer is 0.0011 LA PCME s/cc.

Because the non-cancer RBC is lower than the cancer RBC, the non-cancer RBC (0.0011 LA PCME s/cc) is used to derive the TAS. Assuming that about 50% of all LA fibers are PCME, this corresponds to an RBC (based on total LA) of about 0.0022 total LA s/cc. It is important to note that these RBCs are based on a long-term chronic exposure scenario, not an acute scenario.

Step 2: Determining the Target Analytical Sensitivity

The TAS is determined by dividing the RBC by the target number of structures to be observed during the analysis of a sample with a true concentration equal to the RBC:

TAS = RBC / Target Count

The target count is determined by specifying a minimum detection frequency required during the analysis of samples at the RBC. This probability of detection is given by:

Probability of detection = 1 - Poisson(0,Target Count)

Assuming a minimum detection frequency of 95%, the target count is 3 structures. Based on this, the TAS is:

TAS = (0.0022 s/cc) / (3 s) = 0.0007 cc^{-1}

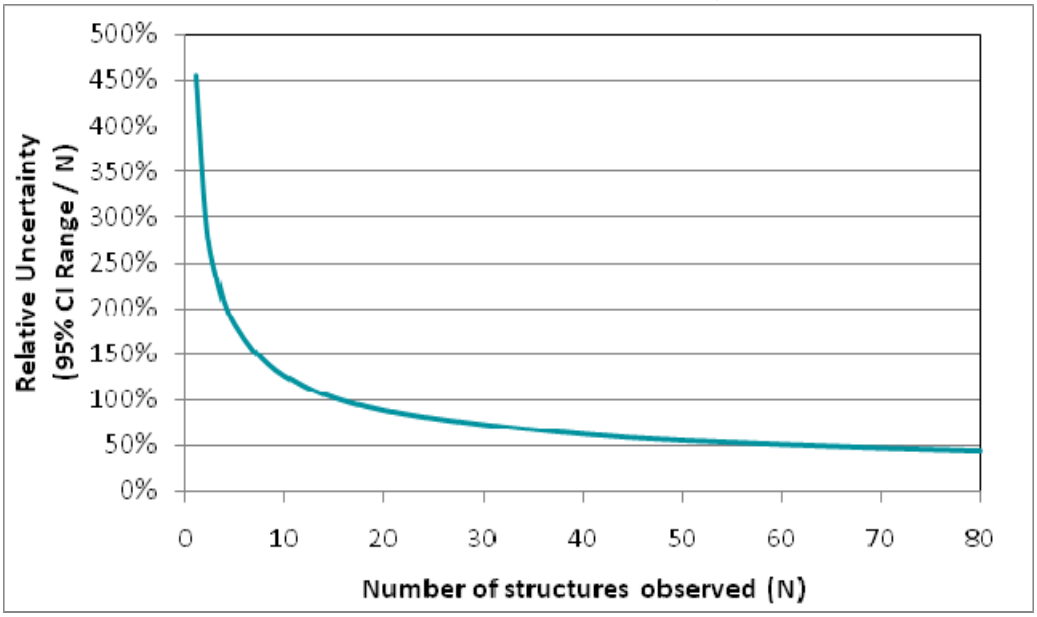
Maximum Number of LA Structures

Ideally, all samples would be examined by TEM until the TAS is achieved. However, for filters that have high asbestos loading, reliable estimates of concentration may be achieved before achieving the TAS. This is because the uncertainty around a TEM estimate of asbestos concentration in a sample is a function of the number of structures observed during the analysis. The 95% confidence interval (CI) around a count of N structures is computed as follows:

Lower bound (2.5%) = ½ * CHIINV(0.975, 2 * $N_{observed}$ + 1)
Upper bound (97.5%) = ½ * CHIINV(0.025, 2 * $N_{observed}$ + 1)

As N_{obs} increases, the absolute width of the CI range increases, but the relative uncertainty (expressed as the CI range divided by N_{obs}) decreases. This concept is illustrated in the figure below.

Relationship Between the Number of Structures Observed and Relative Uncertainty



CI = confidence interval

The goal is to specify a target N such that the resulting Poisson variability is not a substantial factor in the evaluation of method precision. As shown in the figure, above about 50 structures, there is little change in the relative uncertainty. Therefore, the count-based stopping rule for TEM should utilize a maximum structure count of 50 structures.

Maximum Area to be Examined

The number of grid openings that must be examined (GOx) to achieve the target analytical sensitivity is calculated as:

$$GOx = EFA / (TAS \cdot Ago \cdot V \cdot 1000 \cdot f)$$

where:

EFA = Effective filter area (assumed to be 385 mm^2)
TAS = Target analytical sensitivity $(cc)^{-1}$
Ago = Grid opening area (assumed to be 0.01 mm^2)
V = Sample air volume (L)

1000 = L/cc (conversion factor in L/cc)
f = Indirect preparation dilution factor (assumed to be 1 for direct preparation)

A total of about 8 grid openings will need to be examined to achieve a TAS of 0.0007 cc^{-1}, assuming an air sample volume of 7,200 liters (24 hour sample duration x 60 minutes/hour x 5 liters/minute flow rate) and that the filter is able to be prepared directly (f-factor = 1). The number of grid openings that will need to be examined is inversely proportional to the dilution needed (i.e., an f-factor of 0.1 will increase the number of grid openings by a factor of 10). If the f-factor is very small, it is possible that the number of grid openings that would need to be examined to achieve the target analytical sensitivity may be cost or time prohibitive. In order to limit the maximum effort expended on any one sample, a maximum area examined of 1.0 mm^2 is identified for this project. Assuming that each grid opening has an area of about 0.01 mm^2, this would correspond to about 100 grid openings.

Summary of TEM Stopping Rules

The TEM stopping rules for this study should be as follows:

1. Examine a minimum of two grid openings from each of two grids.
2. Continue examining grid openings until one of the following is achieved:
    a. The TAS (0.0007 cc^{-1}) is achieved.
    b. 50 LA structures have been observed.
    c. A total filter area of 1.0 mm^2 has been examined.

When one of these criteria has been satisfied, complete the examination of the final grid opening and stop.

APPENDIX B

STANDARD OPERATING PROCEDURES (SOPs)

Panel A: Field SOPs[a]

SOP ID	SOP Description
OU3 SOP No. 7	Equipment Decontamination
OU3 SOP No. 8	Sample Handling and Shipping
OU3 SOP No. 9	Field Documentation
OU3 SOP No. 11	GPS Data Collection
OU3 SOP No. 12	Investigation Derived Waste (IDW) Management
AMB-LIBBY-OU3	Sampling of Outdoor Ambient Air

Panel B: Laboratory SOPs[b]

SOP ID	SOP Description
EPA-LIBBY-08	Indirect Preparation of Samples for TEM Analysis

Panel C: Data Verification SOPs[a]

SOP ID	SOP Description
EPA-LIBBY-09	TEM Data Review and Data Entry Verification
EPA-LIBBY-11	FSDS Data Review and Data Entry Verification

[a] The most recent versions of all SOPs are provided electronically in the OU3 eRoom *(https://team.cdm.com/eRoom/mt/LibbyOU3)*.

[b] The most recent versions of all SOPs are provided electronically in the Libby Lab eRoom *(https://team.cdm.com/eRoom/mt/LibbyLab)*.

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APPENDIX C

FIELD SAMPLE DATA SHEETS (FSDSs)**

***The most recent versions of FSDS forms are provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3).*

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APPENDIX D

CHAIN OF CUSTODY (COC) FORMS**

***The most recent versions of COC forms are provided electronically in the OU3 eRoom (https://team.cdm.com/eRoom/mt/LibbyOU3).*

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APPENDIX E

ASBESTOS LABORATORY ACCEPTANCE CRITERIA FOR LIBBY ASBESTOS SUPERFUND SITE

MINIMUM LABORATORY ACCEPTANCE CRITERIA

1. Must be certified by the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of asbestos by PLM[8] and/or TEM[9].

2. Must have a laboratory-specific Quality Management Plan and all relevant SOPs in place for asbestos environmental sample processing and analysis.

3. Must have multiple experienced analysts on staff capable of running PLM visual area estimation methods [NIOSH 9002, EPA 600] and/or TEM methods [ISO 10312, ISO 13794, AHERA, ASTM 5755, EPA Method 100.2] (a minimum of 2 analysts within each laboratory are needed to assess within-laboratory reproducibility). Must have documentation in place demonstrating all analysts work experience and training related to analyses performed.

4. Must be familiar with standard TEM and PLM preparation methods. TEM laboratories must have ability to perform indirect preparation and ashing (for the analysis of air, dust, other media) and/or ozonation/UV/sonication treatment (for the analysis water). PLM laboratories must have the ability to dry samples (for PLM-NIOSH 9002 analysis). If the PLM laboratory wishes to perform soil sample preparation in support of the Libby-specific PLM methods (i.e., PLM-VE and PLM-Grav), the laboratory must have the ability to sieve and grind soil samples in accordance with the Libby-specific preparation method.

> Note: Not all laboratory facilities need to have all preparation capabilities; media analysis could be segregated based on facility capability (i.e. one laboratory does water, another does soil, etc.).

5. TEM laboratories must have Energy Dispersive Spectroscopy (EDS) and Selected Area Electron Diffraction (SAED) capability incorporated into their microscope(s).

6. Must participate in monthly EPA laboratory calls for the Libby project.

7. Must participate in inter-laboratory analyses with other Libby project laboratories.

8. Must participate in annual EPA (QATS) audits and in other laboratory and/or data audits if data quality issues arise, as deemed appropriate by EPA.

9. Must be capable of using Libby-specific bench sheets to record observations and utilizing Libby-specific electronic data deliverables (EDDs) to report analytical results.

10. Must have the capacity to meet the required delivery schedules and turn-around times.

11. Must designate laboratory primary and secondary points of contact for discussion of EPA/laboratory issues.

[8] http://www.nist.gov/nvlap/upload/NIST-HB-150-3-2006-1.pdf
[9] http://www.nist.gov/nvlap/upload/NIST-HB-150-13-2006-1.pdf

EPA APPROVAL PROCESS

1. Once potential laboratories are identified that meet the minimum acceptance criteria, they must show proficiency in analysis of NIST/NVLAP performance evaluation samples and inter-laboratory samples (standard PLM visual area estimation and TEM only, no Libby-specific method modifications and requirements).

2. If proficiency is documented, an EPA (QATS) audit will be performed.

3. If any deficiencies found during the audit are sufficiently resolved to EPA's satisfaction, then project-specific mentoring will be conducted to ensure laboratories are proficient in the Libby-specific methods, modifications, and requirements.

4. Once a laboratory has passed all of these steps, EPA will approve the use of the laboratory and documentation to this effect will be sent to the laboratory. Samples can then be sent to the laboratory for analysis.

APPENDIX F

ANALYTICAL REQUIREMENTS SUMMARY SHEET

[OU3FIRE-0812]

SAP ANALYTICAL SUMMARY # OU3FIRE-0812
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS

SAP Title: Wildfire Contingency Air Monitoring Plan, Operable Unit 3, Libby Asbestos Superfund Site

SAP Date/Revision: August 2012 (Revision 0)

EPA Technical Advisor: Christina Progess (303-312-6009, progess.christina@epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: The purpose of this study is to collect opportunistic samples of ambient air during authentic wildfires that occur in OU3. 24-hour samples will be collected from each of three stationary air monitors and 30-60 minute samples will be collected from a mobile monitor placed downwind of the fire for the duration of the wildfire event. All samples will be analyzed by TEM using rapid turn-around methods to allow for reporting of results within 24-hours of sample receipt.

Index ID Prefix: SM-xxxxx

TEM Preparation and Analytical Requirements for Air Samples [a]:

Medium Code	Medium	Preparation Details [b]				Analysis Details			Applicable Laboratory Modifications (current version of)
		Investi-gative?	Indirect Prep?		Filter Archive?	Method	Recording Rules	Analytical Sensitivity/ Stopping Rules	
			With Ashing	Without Ashing					
A	Ambient Air	Yes	Yes	No	Yes	Rapid turn-around TEM	*See OU3 ISO Method Modification #3: Rapid Analysis of Air*	Count a minimum of 2 grid openings in 2 grids, then continue counting until one is achieved: i) sensitivity of 0.0007 cc^{-1} is achieved ii) 50 structures are recorded iii) A total filter area of 1.0 mm^2 has been examined (approx. 100 grid openings)	LB-000016, LB-000029, LB-000067, LB-000085

[a] Sample results need to be submitted within 24 hours of sample receipt.
[b] Grid preparation should be performed in basic accordance with Section 9.3 of ISO 10312:1995(E). If necessary, samples may be prepared indirectly with ashing in accordance with SOP EPA-LIBBY-08.
[c] If observed, chrysotile structures should be recorded, but chrysotile structure counting may stop after 25 structures have been recorded.

TEM Preparation and Analytical Requirements for Air Field Quality Control Samples:

Medium Code	Medium, Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications (current version of)
		Indirect Prep?		Archive?	Method	Recording Rules	Stopping Rules	
		With Ashing	Without Ashing					
B	Air, lot & field blanks	No	No	Yes	TEM – ISO 10312	All asbestos; L: ≥ 0.5 µm AR: ≥ 3:1	Examine 10 grid openings.	LB-000016, LB-000029, LB-000066, LB-000067, LB-000085

Laboratory Quality Control Sample Frequencies:

TEM [f]: Lab Blank – 4%
Recount Same – 1%
Verified Analysis – 1%
Repreparation – 4%
Recount Different – 2.5%
Inter-laboratory – 10% [g]

[f] See LB-000029 for selection procedure and QC acceptance criteria.
[g] *Post hoc* selection to be performed by the QATS contractor.

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	8/7/12	--

Analytical Laboratory Review Sign-off:

☐ EMSL – Libby [sign & date: _____]
☐ EMSL – Cinnaminson [sign & date: _____]
☐ MAS [sign & date: _____]
☐ ESAT [sign & date: _____]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]

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APPENDIX G

RECORD OF MODIFICATION FORMS

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FIELD MODIFICATION APPROVAL FORM
LFM-OU3-xx
Libby OU3 Wildfire Contingency Air Monitoring Plan

Requested by: _____ Date: _____

Description of Deviation:

_____
_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

_____
_____
_____
_____

_____ _____
Christina Progess, EPA RPM Date

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Request for Modification
to
Laboratory Activities
LB-0000XX

Instructions to Requester: E-mail form to contacts at bottom of form for review and approval.

All Labs Applicable Forms – copies to: EPA LC, QATS contractor, All Project Labs

Individual Labs Applicable Forms – copies to: EPA LC, QATS contractor, Initiating Lab

Method (circle all applicable):

TEM-AHERA	TEM-ISO 10312	PCM-NIOSH 7400
EPA/600/R-93/116	ASTM 5755	TEM 100.2	SRC-LIBBY-03
SRC-LIBBY-01	NIOSH 9002	Other:_____	

Requester:_____ Title: _____

Company: _____ Date: _____

Original Requester: _____ Original Request Date: _____

[only applicable if modification is a revision of an earlier modification]

Description of Modification:

_____

Reason for Modification:

_____

Potential Implications of this Modification:

_____

Laboratory Applicability (circle one): **All** **Individual(s)** _____

This laboratory modification is (circle one): **NEW** **APPENDS to** _____ **SUPERCEDES** _____

Duration of Modification (circle one):

Temporary Date(s): _____

Analytical Batch ID: _____

Temporary Modification Forms – Attach legible copies of approved form with all associated raw data packages

Permanent (Complete Proposed Modification Section) Effective Date: _____

Permanent Modification Forms – Maintain legible copies of approved form in a binder that can be accessed by analysts.

Proposed Modification to Method (attach additional sheets if necessary; state section and page numbers of method when applicable):

_____

REFERENCES

Data Quality Indicator (circle one) – Please reference definitions below for direction on selecting data quality indicators:

Not Applicable **Reject** **Low Bias** **Estimate** **High Bias** **No Bias**

DATA QUALITY INDICATOR DEFINITIONS:

Reject - Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

Low Bias - Samples associated with this modification form are useable, but results are likely to be biased low. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated low.

Estimate - Samples associated with this modification form are useable, but results should be considered approximations. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimates.

High Bias - Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias - Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

Technical Review: _____ Date: _____
(Laboratory Manager or designate)

Project Review and Approval: _____ Date: _____
(USEPA: Project Manager or designate)

Approved By: _____ Date: _____
(USEPA: Technical Assistance Unit Chief or designate)